Railway Age
and
Railway Engineering and Maintenance
DAILY EDITION

Vol. 86 *March 5, 1929* *No. 9A*

Contents

Electricity and the Engineer

An interesting and significant side light on the railway appliances show is found in the increasing number of electrically-operated devices on display. It would take a long time to make an exact count of all the devices and instruments in the Coliseum which are electrically operated in part or whole, but their extent is indicated by the fact that approximately 80 out of the 165 exhibitors observed, displayed such devices, ranging from signal and train control apparatus to hoists, ballast machines, pumps and various power tools for use in railway maintenance and operation. Electrical energy is proving itself every day as a servant of railways in accomplishing work with less men or money or in doing work more expeditiously and reliably, and the greater extent to which electrical power or current is becoming available to the departments through the perfection and extension of batteries, power plants and power lines, puts the opportunity up to railway engineering officers to utilize.

An Efficient Machine

THE disparity between the small attendance at the annual meetings of the National Railway Appliances Association and the actual firm membership of that organization might be taken by one not initiated as evidencing a general lack of interest in its affairs. Every member firm has representatives in the Coliseum when the meeting is held there, so why should they not all be represented, unless for lack of interest? The fact of the matter is that convention week is a busy time and it is not always expedient for exhibitors to leave their booths at any given hour, but what is far more pertinent is that the management of the N. R. A. A. is a smooth working organization directed by seasoned heads and governed by rules of practice developed through years of experience. This does not mean that Secretary Kelly's path is a rosy one—exhibits cannot be assigned space, put in place and removed again without some clashing of interests, but that is all in the day's work, and the fact that politics plays such a minor part in this organization is surely testimony to the confidence which the members have in their officers.

This Week, an Opportunity

HOW much is my road going to get out of the convention this week? This is a question which engineering officers of the railroads have been thinking about during the last few weeks. The Signal section and the A. R. E. A. conventions, and the signal and track appliance exhibit are the outstanding events of the year in the field of railway engineering. Many of the higher officers are aware of the benefits which they themselves

derive from these functions and permit only the most urgent business to keep them from Chicago during the convention week. Do these same men always stop to consider that there are other men on their roads who may be just as anxious to attend the convention and the exhibit, and who await only a suggestion from their superior officers to spend a day or two in Chicago while the convention is in session? With the rapid development in the adaption and use of labor and time-saving equipment, and the increase in the duties and the responsibilities of track, bridge and building, and signal supervisors, it is doubtful if there is any other opportunity during the year that means more to these men than a day or two in the atmosphere of the convention and the exhibit. A number of railway officers have begun to appreciate this fact more fully, and from year to year have been advising their men to so arrange their work that they can spend a day or two in Chicago during the convention.

The Value of a Specification

WHAT is the measure of the value of a specification? This is a pertinent question in view of the large amount of time that both the Signal Section, A. R. A., and the A. R. E. A. spend in the formulation of specifications. Is not the answer the extent to which the specification is accepted by various roads, in whole or in part? If this is correct, it would not appear amiss for the different committees to investigate the extent to which their various specifications are used and, where they are not employed, to ascertain the reasons for their rejection? By such surveys and particularly by determining the objections to the specifications, the committee should be able to ascertain wherein their specifications fall short of meeting the requirements of the roads.

It is not to be expected that all specifications can be so drawn as to meet the needs of all roads. It is equally true that many of the specifications of the Signal Section, A. R. A. and of the A. R. E. A. fall far short of the acceptance that they should receive. To the extent of this shortcoming, they fail to achieve the purpose for which they were drafted and to justify the energy spent on them.

During the last few years, under the leadership of Herbert Hoover as Secretary of Commerce, much progress has been made in the simplification and standardization of materials in industry. With Mr. Hoover in the presidential chair, it is to be expected that this trend will receive much greater momentum. The Signal Section, A. R. A., and the A. R. E. A. can participate in this movement by bringing their specifications more nearly in accord with the practices of the roads. After this is done it would not be amiss for them to undertake a campaign of education to stimulate the favorable acceptance of their specifications by the roads.

Parkway Cable With or Without Lead Sheathing

COMMITTEE IX—Overhead and Underground Lines, of the Signal Section, A. R. A., presented for discussion at the convention yesterday, a specification for parkway cable which includes a requirement for a lead sheath over the insulated conductors of the cable. In view of the difference of opinion among signal engineers as to the merits of such a sheath, it is unfortunate that this feature of the proposed specification was not discussed thoroughly.

Certain signal engineers contend that the lead sheath crystallizes at places where the cable is bent, or under tracks where it is subject to vibration and that after this occurs, the sheath opens up, permitting moisture to come into contact with the insulation, which must be of sufficient thickness to withstand this action. It is contended, therefore, that if the insulation must be of sufficient thickness to withstand the action of dampness, the purpose of the lead sheath is nullified, and it may as well be eliminated, thus saving the cost of the lead or making available the money thus saved for additional insulation.

On the other hand, good arguments may be presented by men who have had experience with cable, and who favor the use of lead sheath as required in the proposed specification. These men contend that if proper care is taken in handling and installing the cable, the lead sheath will give practically permanent protection for the insulation, while in the event that the sheath does give away at some point, the proportion of the area affected is so small that it is only a hundred-to-one chance that water will accumulate in sufficient quantities to affect the insulation at the spot where the lead fails. The cable must, of course, be installed in such a manner that the solid conductors will not be subjected to vibration, which might break them, and, if this is done, the lead covering should be fairly safe. The conclusion of these men is that even if the lead ever does fail at a few points the insulation at these points has been protected for a sufficient period to justify the cost.

It may be seen, therefore, that there is much to be said on both sides of the question. Futher, it is not a feature that can be sidestepped readily by an alternate requisite, for, if the lead sheath is not used, heavier insulation is needed to insure the desired life of the cable. Those who do not intend to use lead sheath cable should have explained their views for the benefit of the committee as well as others, for the entire purpose of establishing the specification will be defeated if it is approved by letter ballot for inclusion in the Manual with features that may not be accepted in practice by the majority.

Indications and Aspects of Semaphores vs. Light Signals

AN ideal arrangement of simplified signal aspects is that which will permit an engineman to concentrate on the one unit which gives him authority to proceed or direct him to reduce speed as the case may be. If an engineman must pick out a green light, shown simultaneously with one or more red lights, more time is required for him to catch the indication. Likewise red lights lose their significance when he is passing them frequently. The solution is to provide aspects such that an engineman never has authority to pass a red light at speed. In the standard code of the Operating Division, A. R. A., the aspects, indications and names are given for semaphore signals with the notation: "The day and night aspects for color-light signals shall have the same colors as the night aspects of the semaphore signals."

The most important part of the report of the Committee on Signaling Practice, as presented yesterday at the annual convention of the Signal Section, A. R. A., included a set of charts showing the aspects, indications and names of light signals to conform with those of the semaphore signals shown in the standard code. It may or may not be in the domain of the committee to go further and explain the possibilities of simplifying the aspects of light signals as compared with semaphores. The charts are accompanied by a note as follows: "The aspects shown are typical. Each road should show the aspects and colors of lights it uses."

For those roads which are adopting light signals extensively, the fundamental difference which can be used to advantage is that a light can be extinguished when not needed in an aspect, whereas a semaphore arm, together with its accompanying light, cannot be so disposed of temporarily. For example, with the position-light signal used on the Pennsylvania, the lights in the second arm or unit are not illuminated except when required in the aspect. The same effect is secured with the color-position light signals used on the Baltimore & Ohio. With a color-light signal, when the light is out there is no signal, while with a position-light signal when one light burns out two lamps are left to give the indication. For example, in a color-light signal, with a "red" over a "green" to indicate proceed not to exceed minimum speed, if the red light burns out, the green light, remaining alone, indicates "proceed." With the position-light signal, this hazard of a burned out light does not exist for there are three lights in a row for each indication. Likewise with the color-position-light signal, as used on the B. & O., extra protection is provided by using two lights in each row and if one light goes out the color still remains.

Marker lamps have been used for years on semaphores as well as on color-light signals to provide a second light to act as a stop indication in case a signal light burns out. On some of the more recent installations, marker lights have not been considered necessary, as for example on the Texas & Pacific extensive color-light signal installations, where the signal cases, ladders and poles are painted with aluminum paint and stand out conspicuously in daylight as well as at night under the glare of a locomotive headlight. Modern light-out relay circuits and indication-checking transformer circuits are available for checking lamps in multiple-unit signals.

It may be seen, therefore, that means are available to take advantage of this characteristic of light signals to secure simplification of signal aspects as compared with semaphores. The railroads of England, in designing their four-aspect color-light system, did not follow the aspects of semaphores used previously. The Pennsylvania and the Baltimore & Ohio have to a certain extent accomplished simplification of aspects by the use of position-light or color-position-light signals, and certain users of color-light signals have taken steps in this direction. The committee has presented a uniformity of indications and names for all types of signals, as shown under the new code with aspects as a guide, and has thus provided all the uniformity and simplicity possible at this time. It remains for the roads interested to make such progress in the simplification of aspects with light signals as they consider safe practice with the equipment available.

Announcements

A. R. E. A. Program

Morning Sessions: 9:00 a. m. to 12:30 p. m.
Afternoon Sessions: 2:00 p. m. to 5:30 p. m.

TODAY

President's address—W. D. Faucette

Reports of secretary and treasurer

Reports of committees on:
- **Standardization**
- **Water Service and Sanitation**
- **Roadway**
- **Ballast**
- **Ties**

Address—New Southern Pacific Bridge (Illustrated by Lantern Slides), by C. R. Harding, engineer of standards, S. P.

Reports of Committees on:
- **Uniform General Contract Forms**
- **Shops and Locomotive Terminals**
- **Clearances**
- **Co-operative Relations with Universities**

Evening—Visit to Railway Appliances Exhibit at Coliseum

TOMORROW

Reports of committees on:
- **Rules and Organization**
- **Yards and Terminals**
- **Rivers and Harbors**
- **Wood Preservation**
- **Stresses in Railroad Track**

Address by Major-General Edgar Jadwin, chief of engineers, United States Army.

Report of committees on:
- **Grade Crossings**
- **Track**
- **Electricity**
- **Signals and Interlocking**

THURSDAY

Reports of committees on:
- **Iron and Steel Structures**
- **Wooden Bridges and Trestles**
- **Masonry**
- **Records and Accounts**
- **Buildings**

Address by O. H. Caldwell, member, Federal Radio Commission

Reports of committees on:
- **Rail**
- **Economics of Railway Location**
- **Economics of Railway Operation**
- **Economics of Railway Labor**

Signal Section Program

Tuesday, March 5, 1929

Address by L. F. Shedd, General Claim Agent, Chicago, Rock Island & Pacific.
Committee XI—Chemicals.
Special Committee—Highway Crossing Protection.
Committee V—Instructions.
Committee VI—Designs.
Unfinished business.
New business.
Election Announcements.
Adjournment.

CONVENTIONALITIES

If you want to keep abreast of the times, talk to Sam Florence, signal engineer of the Pacific Electric. Sam has been studying up on television as applied to radio and almost any night now, he can tune in and get a picture of John G. Snockwatch from KDKA.

E. Winans, signal engineer for the Coast Lines of the Atchison, Topeka & Santa Fe, came all the way from Los Angeles to tell the signallers all about the new vice-president of the United States. Winans and "Charlie" Curtis are from the same town in Kansas.

E. P. Weatherby, signal engineer of the Texas & Pacific, has been up in the air lately. By this we do not mean that he has been excited over an installation of 527 miles of signaling in six months, but that he and Harry Lucia took an airplane trip over the city of Dallas.

Everybody is glad to see E. S. Taylor, signal engineer of the Canadian Pacific, in attendance at the Signal Section convention because it will be remembered that at this time last year, Mr. Taylor was seriously ill with pneumonia, several months having been required before he was back to his normal self.

A Fish Story

Walter Boland, signal engineer of the Southern Pacific, ordinarily spends a few days in Chicago following the convention of the Signal Section, but this year he states that he must rush back to his job because he is in the midst of an 800-mile signaling program. In fact, Walter says that he is so busy that he hasn't had time to go fishing for a year or so. By the way, it is of interest to know that Mr. Boland is known to be the most excellent fly fisherman in the state of California and, as an authority on this subject, he recommends the use of a 4½ oz. Divine rod. His favorite trout flies include Royal Coachman, Silver Dart and Red Gnat.

The Dinner Bell Is Ringing

If you haven't your tickets yet for the A. R. E. A. annual dinner, you had better hop to it and get them. The reason why? Well, take a squint at the following sentence from Chairman Simpson's announcement:

"The dinner this year will be different; it will be distinctive and enjoyable." That may mean anything from hula dancers to noodle omelettes, so be prepared. As one member expressed it:

"Now that we have progressed, as indicated by this paragraph, we may, without fear, make reservations for the annual dinner. I have accordingly done so—and how!"

Peculiarly enough, the man who writes so enthusiastically about the dinner is named Cook.

Harry Lorenzen, assistant signal engineer, Pere Marquette, is known as one of the champion rabbit hunters in the state of Michigan.

When it comes to cows and chickens, perhaps none of the signal engineers are so well informed as E. K. Post of the Pennsylvania, on whose dairy farm in Vermont it is reported that each cow has an individual drinking cup.

Geo. Marloff of the Union Switch & Signal Company is one of these high-speed fellows. In fact, when he bought his Buick not long ago he drove the car in high speed for a week before he found he had any other choice.

Ben Schwendt, assistant signal engineer of the New York Central, in Cleveland, recently took a day off to go pheasant hunting. The way we get the story is this. A pheasant was swimming across a small stream with the dog close behind. Ben up and took a shot and hit the dog instead of the pheasant.

Glen Wesson, assistant signal engineer of the Burlington, with headquarters at Lincoln, Neb., is an expert "side-line coacher" for the football team of the Nebraska State University. Glen has a reserved seat for every game and has mapped out a route from his office chair to his seat that can be covered in 10 minutes.

"Stevie" Socks One

Tom Stevens, signal engineer of the Santa Fe System, which recently placed an order for 1,150 signals for its 1929 program, is so busy that he has to cut down his time allotted to golf. In fact, Mr. Stevens has been so successful in this that he now makes a hole in one, having accomplished this feat at the Topeka Country Club, at 5:28 p. m. on July 7, 1928. His average for 18 holes runs in the nineties, and in order to do this he has to work in several birdies, eagles, etc.

A Gumshoe Man

Carl Henze, of the Chicago office of the General Railway Signal Company, cannot be classed among the hot-foot men. In fact, Carl is a cold-foot man, because he wears his four-buckle overshoes every day during the winter. Carl claims that there is a lot of snow out in Park Ridge where he lives. Nevertheless, he hikes all the way through the loop with his big overshoes. When asked why he didn't check them at the North Western station in the morning, Carl replied that this would cost him a dime.

Jim Mock, signal and electrical engineer of the Michigan Central, told a friend yesterday that he was returning directly to Detroit this year instead of following the schedule of a year ago, at which time he and some friends took a trip to White Sulphur Springs following the March convention with the idea of playing golf, but on arrival they found the links covered with snow and the only games played were around the bridge table.

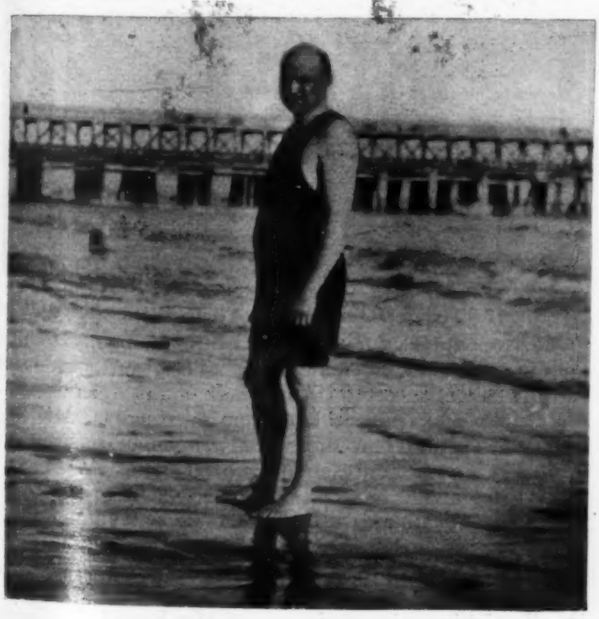
One of the early arrivals is I. H. Schram, regional engineer of the Erie. Mr. Schram got in Monday to insure a good start and to miss nothing. Since he was here last, the Erie has gone to 130-lb. rail on its main line and Mr. Schram is alert for tips on this as well as means for spending the heavy improvement budget allotted to him this year.

J. C. Mill, signal engineer, Chicago, Milwaukee, St. Paul & Pacific, who lives in Milwaukee, is spending a couple of days at the Signal Section convention enroute to Vero Beach, Fla., where he and his brother have 40 acres of bearing orchard of citrus fruit. If you get friendly with Julius, perhaps he will send you a grapefruit, or maybe a lemon.

Ed. Stradling, superintendent of telegraph and signals of the Monon, is on hand at the convention of the Signal Section with his face washed. Perhaps you do not know that Stradling was recently lost for three days and they finally found him in a new duct line which he is installing through Lafayette to be used in connection with the new telephone train dispatching under construction.

The Wild Waves

The incoming president of the association, Louis Yager of the Northern Pacific, although he lives in the cold and frozen north, is by no means unskilled in the pleasures and pastimes of milder climates. This is indicated by the accompanying illustration, which shows, in the order named: a pier, the Pacific Ocean, and Mr. Yager. The locale is Long Beach, Cal.



Yep! It's Louis Yager

The Water Service committee will hold its second annual luncheon at 12:30 this noon in private dining room No. 8 on the third floor.

Art McKeen, system signal engineer, Union Pacific System, has, during the past winter, neglected his home work of building superheterodyne radios in the basement. Lately his spare time has been devoted to preparing the section on signaling which is to be included in the Railway Engineering and Maintenance Cyclopedia.

Dan Fuller, assistant signal engineer, Eastern lines of the Santa Fe, is one of these boys who is always on the job. The fact is, he won't even leave the railroad when he gets a vacation. Not long ago when the boss kicked him out to take a little rest he later found that Dan had spent the whole two weeks "chasing" over the entire Santa Fe System in company with H. C. Chace, superintendent of telegraph, in his private car.

Among those who are conspicuous for their absence at this convention is J. H. Waterman, retired superintendent of timber preservation of the Burlington, who passed away early last month at his home in Galesburg, Ill. Mr. Waterman was a regular attendant at the A. R. E. A. convention for more than a quarter of a century. He was known particularly among wood preservers for his unique and pleasing ability to respond to the customary address of welcome at the annual conventions of the Wood Preservers' Association. It was in debate at one of these meetings that he referred unwittingly to the empty cell treatment as the "empty tank" treatment, a nomenclature which clung to him until his death.

The Magic 7

Students of numerology would find much to interest them in the summary of membership of the Signal Section. In fact, the constantly recurring 7's in the summary would be taken as a guarantee of the good fortune attending the meetings by the numerologists, for, as is well-known, 7 is considered an unusually benevolent number. To illustrate, there are 77 members who are signal engineers, 7 presidents, 7 circuit engineers, 7 supervisors of train control, 7 assistant supervisors and 7 assistant signal maintainers, not to mention 74 superintendents, 179 assistant signal supervisors, 97 signal inspectors and 79 signal maintainers. To those who are superstitious, all the omens point to a good meeting.

Honoring President Hoover

Since President Hoover honored the Signal Section by being inaugurated on the opening day of the convention, it was felt only just that the Signal Section return the courtesy. Accordingly F. W. Pfleging, signal engineer of the Pennsylvania, did the honors by moving that President Hoover be elected a member of the Signal Section. The motion was carried unanimously and the following message was sent to the new President:

"The Signal Section of the American Railway Association, comprised of engineers in the United States, sends greetings and best wishes for a happy and successful engineering administration. You have been elected an honorary member of this body."

That Clyde P. Ross, vice-president of the Roberts & Schaefer Company, is interested in the N. R. A. A. is indicated by the fact that he came all the way from Havana to attend. Mr. and Mrs. Ross sailed on February 15 from New York and after visiting Havana, spent some time basking in the Florida sun.

Among the welcome visitors at the Signal Section yesterday was H. L. Engelhardt, signal expert of the California Railroad Commission, who, of course, is particularly interested in the grade crossing question. His presence is indicative of a real spirit of co-operation on the part of the California commission.

Although more than 850 tickets have already been sold for the annual dinner of the A. R. E. A. on Wednesday night, the Arrangements committee wishes it to be known that there are still desirable seats available. They are, however, going fast, so that if the story of the early bird is to be believed, those who have not yet secured their tickets will not delay further.

L. W. McChesney, vice-president of Thomas A. Edison, Inc., Bloomfield, N. J., is a busy man these days. He has been made vice-president and general manager of the Splitdorf Radio Corporation, the Splitdorf-Bethlehem Electric Company and the Splitdorf Electrical Company. Mr. McChesney's activity in these companies as well as his activity in the business of Thomas A. Edison, Inc., does not give him much time to enjoy winter vacations.

The Executive committee of the Bridge and Building Supply Men's Association, the association of supply men which exhibits at the convention of the American Railway Bridge and Building Association, met at the Palmer House yesterday morning to formulate plans for the next exhibit which will be held at New Orleans, La., on October 15-18. The schedule tentatively arranged provides that the members of the two associations will leave Chicago on a special train on the Illinois Central on Sunday, October 13, stopping to visit the National cemetery and points of engineering interest at Vicksburg on Monday morning and arriving at New Orleans that evening. Following the adjournment of the convention the Celotex Company will conduct the members of the two organizations through its plant, a short distance above New Orleans.

The President's Dinner

President W. D. Faucette of the A. R. E. A. gave a dinner at the Palmer House last evening to a group of 40, including 9 past presidents, members of the Board of Direction and of the Arrangements Committee and special guests. Among those who responded to Mr. Faucette's request for brief remarks were Geo. W. Kittredge, senior past president; Elmer A. Sperry, president of the American Society of Mechanical Engineers; Anson Marston, president of the American Society of Civil Engineers; L. A. Downs, W. C. Cushing, E. H. Lee and J. L. Campbell, past presidents; Samuel O. Dunn, editor of the Railway Age; W. L. Seddon, vice-president, Seaboard Air Line; J. E. Armstrong, director; E. H. Fritch, secretary, and Chairman Simpson of the Arrangements committee.

The large delegation of Seaboard Air Line representatives, including W. D. Faucette, chief engineer, president of the A. R. E. A., and O. R. Teague, superintendent, who is an active committee member in the Signal Section, are keeping their ears close to the telegraph wires. Spring floods are quite seriously menacing their peace of mind, as well as their railway between Savannah and Jacksonville. Let's hope that the elements will be kind both during and after the conventions.

Wedding Bells—Old and New

On February 16, Mr. and Mrs. F. W. Edmunds, affectionately known among their friends as "Bucky" and "Ma" Edmunds, celebrated their golden wedding anniversary at their home, Edmundcrest, West Nyack, N. Y. A host of friends journeyed from their homes in New York, New Jersey, Connecticut and Pennsylvania, to express their good wishes personally to this well-known and congenial couple. Telegrams, cards and flowers were received from their many friends who were unable to congratulate them personally. Mr. Edmunds is secretary of the Signal Appliance Association and also special representative of Thomas A. Edison, Inc., Bloomfield, N. J. Also of much interest is the fact that Mr. and Mrs. Edmunds' silver wedding anniverysary was celebrated in the same house as their golden wedding anniversary.

Their Friends Remembered Them With Flowers

By contrast and for other reasons, friends of Mr. W. R. Collins, vice-chairman of the Signal Appliance Association and sales manager of the Maloney Oil & Manufacturing Company, N. Y., will be interested to learn that he was married on February 6. The bride is not attending the signal meeting with Mr. Collins, but the editor of this column believes that she will be a constant attendant after her first convention.

Signal Section Committee of Direction in Session on Sunday Afternoon

Signal Meeting Characterized By Economic Studies

W. P. Borland outlines attitude of Interstate Commerce Commission on safety devices and train control

CHAIRMAN Carl F. Stoltz, signal engineer of the Cleveland, Cincinnati, Chicago & St. Louis, opened the annual meeting of the Signal Section in the north ballroom of the Stevens hotel at 10 o'clock yesterday morning. Owing to the importance of the first report, that of the Committee on Economics of Signaling, an unusually large number of men were in attendance including a number of operating officers. The registration disclosed that 462 members and 58 guests, as well as 109 ladies, were present.

As a part of the report of the Committee on the Economics of Signaling, three papers and three extemporaneous reports were presented concerning the benefits of car retarders in service in classifications yards on the following roads: the New York, New Haven & Hartford, the Norfolk & Western, the Boston & Maine, the Illinois Central, the Central of New Jersey, the New York Central and the Texas & Pacific.

At the close of business yesterday afternoon, the Signal Section had disposed of seven committee reports. Prior to the presentation of these reports, Secretary H. S. Balliet, special engineer, New York Central Lines, presented his annual report on finance and membership. The Committee on Direction then presented its annual report, which outlines the various activities of the section during the past year.

Borland Outlines Position of Commission

W. P. Borland, director of the Bureau of Safety of the Interstate Commerce Commission, was requested by Chairman Stoltz to make a brief address, in which he stated that the report of the commission last November has been misinterpreted in some respects. The commission has not changed its policy in any way with regard to automatic train control. It appeared to the commission, as a result of the hearing which was held last spring, that the installations which had been made up to that time were of such a character that they needed some further development, and the evidence which was given was of such a nature that it induced the commission to take the position that it would give the railroads an opportunity to develop the existing installations and place them in condition to make them effective for the purpose for which they were intended, and also to determine whether there was not some way whereby interchangeability could be affected between the various systems. The commission is willing that the roads should have plenty of time to work out these problems, he said.

Considerable evidence was also presented at the hearing to the effect that safety of operation, which is the only thing the commission is interested in as a fundamental proposition, could be brought about by methods other than train control. Train control is not the only measure that needs to be considered. The railroads indicated to the commission that they had many of these ideas under consideration and the commission is willing to give them an opportunity to go ahead with the things which they say they intend to do and which ought to be done. We are going to keep tab on the roads to see that you do them, he said.

We are not going to be so insistent about train control as the only thing that needs to be done, but in places where the evidence is positive that train control is needed, the commission is going to require it; while in places where other methods would accomplish the results as effectively as train control, the commission is willing to permit the roads to use those methods.

Do not get the impression that the commission has changed its policy in any respect, or that it is going to let down on this question of safety to the public, he concluded, because that is a duty imposed on it by law. The commission is going to perform its duty just as effectively as it can.

Address of Chairman Stoltz

Modern signaling is increasing safety of operation and facilitating train movements

THE original purpose of this organization was to improve and develop signaling systems so as to obtain increased safety in railroad operation. This purpose has not been changed, except as it has been broadened with the growth and development in rail transportation, to include, in addition to the perfection of a safe and reliable signaling system, the application of that system as a means of obtaining improved and economical operation. In 1895, the late G. M. Basford, in calling the first meeting of the Railway Signal Club, said;

"This meeting has been called with the purpose of inaugurating a systematic movement in the improvement of the signaling of railroads in the hope that the development now begun may lead to such a growth of signaling and of signalmen as to place this country at the head, rather than at the foot, of the list, as to the destruction of life and property, through accidents, which correct and complete signaling would prevent."

We believe that the development and improvements, made during the last 34 years, through the efforts of this organization, have produced a system of signaling that is second to none in the world. It is estimated that an engineman operating on the average American railroad equipped with an automatic block signal system will encounter 25,000 signals displaying correct indications for each one that causes him to make an unnecessary stop. The ratio of correct indications to the number of false indications displayed is conservatively estimated at four million. The average engineman will not encounter a false indication in a life time of service (45 yr.), for it would require the collective life services of three enginemen or 135 yr.

The most recent records on safety show a marked reduction in passenger fatalities. Twenty years ago there were six times as many and ten years ago, three times as many passengers killed as in 1927, when there were but 88. Out of this 88 these were but 10 passengers killed through train accidents, a decrease of 69 as compared with 1926. Over 800 million passengers were carried during the year, so that the ratio was one fatality among about 10 million passengers. We believe that Mr. Basford's hope is being realized and that the development then begun has led to a system of complete signaling, which has, through the prevention of accidents, placed this country at the head of the list.

Signals as a Means of Expediting Train Movements

The purpose of the organization broadened in 1905 when J. C. Mock (M. C.), president of the Railway Signal Association, said: "The question of getting the most out of a unit of track and a unit of motive power is one that is requiring the careful consideration of every general manager and I know of no better representative on his staff than the signal engineer, to assist in the accomplishment of that purpose."

The past year has seen the greatest operating efficiency and economy ever attained by the railroads, and as a result the public has had the best service ever given it. The volume of freight traffic, as compared with the two preceding years, was less, but in spite of this reduction, the improvement in operating efficiency continued to increase throughout the year.

The records established in 1928 are as follows: (1) Fewer trains and locomotives in proportion to the amount of traffic hauled. (2) Average load per train was highest ever recorded, having been 2.6 per cent greater than in the previous year. (3) Distance traveled each day per freight train averaged more than 307 miles, an increase of approximately 20 per cent over 1923. (4) Number of ton-miles moved per hour was greater than ever before. (5) Freight traffic was handled with the greatest conservation of fuel ever reported. Another feature of the performance of the railroads in 1928 was the promptness in handling freight shipments. This was partly due to the co-operation of the shippers in loading and unloading cars promptly, but it was also largely the result of improvements in operating facilities installed by the railroads themselves.

Locomotives of greater power, and cars of greater capacity are being used without a corresponding increase in weight, which not only enables the hauling of heavier tonnage, but permits greater speed. While there has been some increase in the actual speed of trains, the speeding up in the movement of freight is largely brought about by the elimination of delays, both along the line and at terminals. Those delays can only be eliminated by improved operating methods, as neither the co-operation of the shipper nor an improved locomotive will shorten the time that a freight train must wait on a passing track under an antiquated system of operation. This is also true at terminals. The credit for the time saved there must be given to the improvement in methods of operation, in receiving, switching and dispatching trains.

Signal Facilities Improve Operation

There has been a steady improvement in the efficiency of railroad operation for the past six years. Incidentally this improvement began with the enormous increase in automatic block signal mileage which followed the train control order of 1922, and which reached its maximum in 1927.

For obvious reasons, it will be impossible to make the marked showing and to continue the same percentage of increased efficiency during the next six years that has been made in the past. In order to maintain what has been attained, it is necessary that every man in the organization of the railroads be on the alert to make sure that not only are the efficiencies and economies made in the past continued, but that new ones are put into effect. This is the age of machinery. Other industries have long since abandoned hand-operated methods wherever it is possible to substitute machinery.

If the railroads are to earn a fair return on their property investment it will be necessary for them to do so through a greater utilization of present facilities. In the face of the great strides made by the railroads in increased economy of operation, the rail carriers of this country have not been able to earn anything like 5¾ per cent on their property investment, the rate of return in 1928 having been 4.71 per cent, and in 1927, 4.38 per cent.

Much remains to be done in applying modern methods and modern machinery to produce increased economies, without an enormous increase in capital expen-

ditures for roadway facilities. For roads of modern traffic, the cost of improvements, such as an additional track and other facilities for handling an increased volume of business, in many cases becomes a burden, rather than a producer of dividends. The difference in capacity of a single-track line which is adequately equipped with modern signaling and interlocked passing track switches, and the capacity of a double track line, when compared from the standpoint of road capacity and earning capacity, is quite surprising. Careful consideration should be given to the earning capacity of all projected improvements.

The members of the Signal Section of the American Railway Association share largely in the credit for the improvements and betterments which have been made in recent years and which have enabled the railroads to accomplish these good results. The Signal Section provides a field that now offers more possibilities in this respect than ever before and the men, having an intimate acquaintance with the available machinery necessary for keeping trains moving and for handling traffic with a minimum delay, are in a most enviable position to put into effect new efficiencies and economies. The latter are becoming more and more important with the increasing volume of traffic that is being offered the railroads, on account of the industrial growth of the nation.

A Review of the Work of the Year

The progress made by the Signal Section cannot be measured in any single year. An assignment to a committee is generally covered by two or more years' work. The work done by the standing and special committees during the past year speaks for itself. The committee chairmen and members are to be congratulated. The advance notice contained 422 pages of carefully prepared specifications, instructions and reports, and covered the work of 12 committees.

If President Coolidge were a member of the Signal Section, we would doubtless find a place for him on Committee-I. This is the Committee on Economics and its work covers every phase of the economical applications of signal appliances to railway operation.

[Chairman Stoltz continued with a detailed review of the various committee activities of the Signal Section. He referred to the consolidation of the Committee on Mechanical Interlocking and the Committee on Power Interlocking into the present Committee on Interlocking with a consequent simplification of work. Next he touched briefly upon the important research work on track circuits and track relay performance, carried on by the committee on D-C. Block Signaling. In his reference to the work of the Committee on Instructions, Chairman Stoltz paid the following compliment, "This committee has produced much good literature of educational value to every signal man, and which can nowhere else be obtained." The Committee on Designs has endeavored to keep standards up to date and in harmony with modern manufacturing practice so that the railroads may benefit in their purchases. Uniformity of contract forms to govern the maintenance and operation of joint interlocking and signaling facilities has been achieved by the Committee on Contracts. The application of rectifiers and the protection of lines against lightning are two recent assignments to which the Committee on A-C. Automatic Block Signaling has given thought. Among the other committees doing important work to which Chairman Stoltz referred briefly in his address covered the subjects of (1) overhead and underground lines, (2) signaling practice, (3) chemicals and (4) highway crossing protection.]

Carl F. Stoltz
Chairman

Mr. Stoltz was chairman of the Committee on D-C. Signaling during the years 1919 to 1923, and was appointed chairman of the Signal Section in 1928. He was born on December 18, 1885, at Bradford, Ohio. Following graduation from Miami University, Oxford, Ohio, he entered the service of the Illinois Central as a draftsman and later served in the same capacity for the Cincinnati, Hamilton & Dayton. He entered the engineering department of the Cleveland, Cincinnati, Chicago & St. Louis on May 22, 1906, and in June of the next year was assigned to signal drafting. On June 1, 1912, Mr. Stoltz was appointed assistant signal engineer, and on November 20, 1913, he was promoted to signal engineer.

Mr. Stoltz concluded his address with the following paragraph:

"You will recall that Mr. Basford hoped for 'a growth of signaling and of signalment.' The highest tribute I can pay to the older members of this section, these pioneers who have so liberally contributed to the increase of signaling, is the growth of progressiveness that their precepts have instilled in the younger generation. The Signal Section may well be proud of its younger members in whose hands rest the future progress of this organization."

Report of the Committee of Direction

IN ITS report the Committee of Direction called attention to a number of subjects upon which it has taken official action during the past 12 months. An abstract of its report follows: (1) A total of 82 Section memberships were approved. (2) The sub-

ject-matter approved for letter-ballot action at the 34th annual meeting was ordered submitted to the Board of Directors of the American Railway Association for official approval. This action was taken and official approval received July 10, 1928. (3) The 1929 additions and revisions to the Manual, complete to December 31, 1928, containing the subject-matter officially approved by the Board of Directors of the American Railway Association were ready for distribution to Manual holders on September 5, 1928, at $2.75 per set. (4) The 1927 Year Book, Volume XXV, was ready for distribution on August 23, 1928, at $4 per volume to members and $8 to non-members. (5) Chapter VII —Direct-Current Track Circuits; Chap. VIII—Transformers; and Chap. XXIII—Highway Crossing Protection, of the book "American Railway Signaling Principles and Practices," were printed and placed on sale. To date 6 of the 26 chapters have been completed. As the demand for this literature is great, the stock of 10,000 copies each of the first three chapters placed on sale has been exhausted. Reprints of these are, therefore, being made. (6) The appointment of W. M. Post (Penna.) as the executive representative and G. H. Dryden (B. & O.) and W. F. Follett (N. Y. N. H. & H.) as representatives on the joint committee of the American Railway Association, which is studying inductive co-ordination. (7) The appointment of W. M. Vandersluis (I. C.) as the Signal Section representative on the Joint Committee on Electric Traction. (8) The appointment of H. G. Morgan (I. C.) as the Signal Section representative on the Sectional Committee on Standardization and Unification of Screw Threads. (9) The 84th stated meeting of the Signal Section was authorized to be held at the Atlanta-Biltmore Hotel, Atlanta, Ga., on September 10, 11 and 12, 1929.

Annual Report of the Secretary

THE membership of the Signal Section did not change appreciably in volume during the last year according to the report of Secretary Balliet. He reported that 191 new members were added and that the number of members dropped either through death, resignation or otherwise totaled 190. It was indicated that of these latter members 161 were removed on account of non-payment of their dues. This showed a healthier condition than the report of a year ago when 198 names were removed for a similar cause.

Membership as of March 6, 1928		2,405
Additions during year	191	
Losses by death during the year	12	
Resignations	17	
Dropped from roll	161	190
Net gain in membership		1
Total membership today		2,406

Forty-four railroads affiliated and 34 affiliated members were removed from the membership list on account of non-payment of the 1928 dues. There were 80 committee meetings held, 31 of which were held in Chicago; 29 in New York; 4 in Atlantic City, N. J.; 3 in Pittsburgh, Pa.; 3 in Kansas City, Mo.; 2 in Cleveland, Ohio; 2 in Toronto, Ont.; 2 in Detroit, Mich.; and the remaining 4 in the following cities: Omaha, Neb.; Baltimore, Md., Bloomfield, N. J., and Cincinnati, Ohio. The total attendance at all committee meetings was 602 and the total number of copies of minutes covering the meetings was 1,041. During the period covered by this report, 25 publications were issued, containing a total of 3,703 actual pages of printed matter; the total number of copies printed was 73,545 and the total number of standard 6 by 9-in. sheets printed was 6,247,170.

Report on Economics of Signaling

Information on savings made by spring switches, interlocking and dispatcher control systems

J. E. Saunders
Chairman

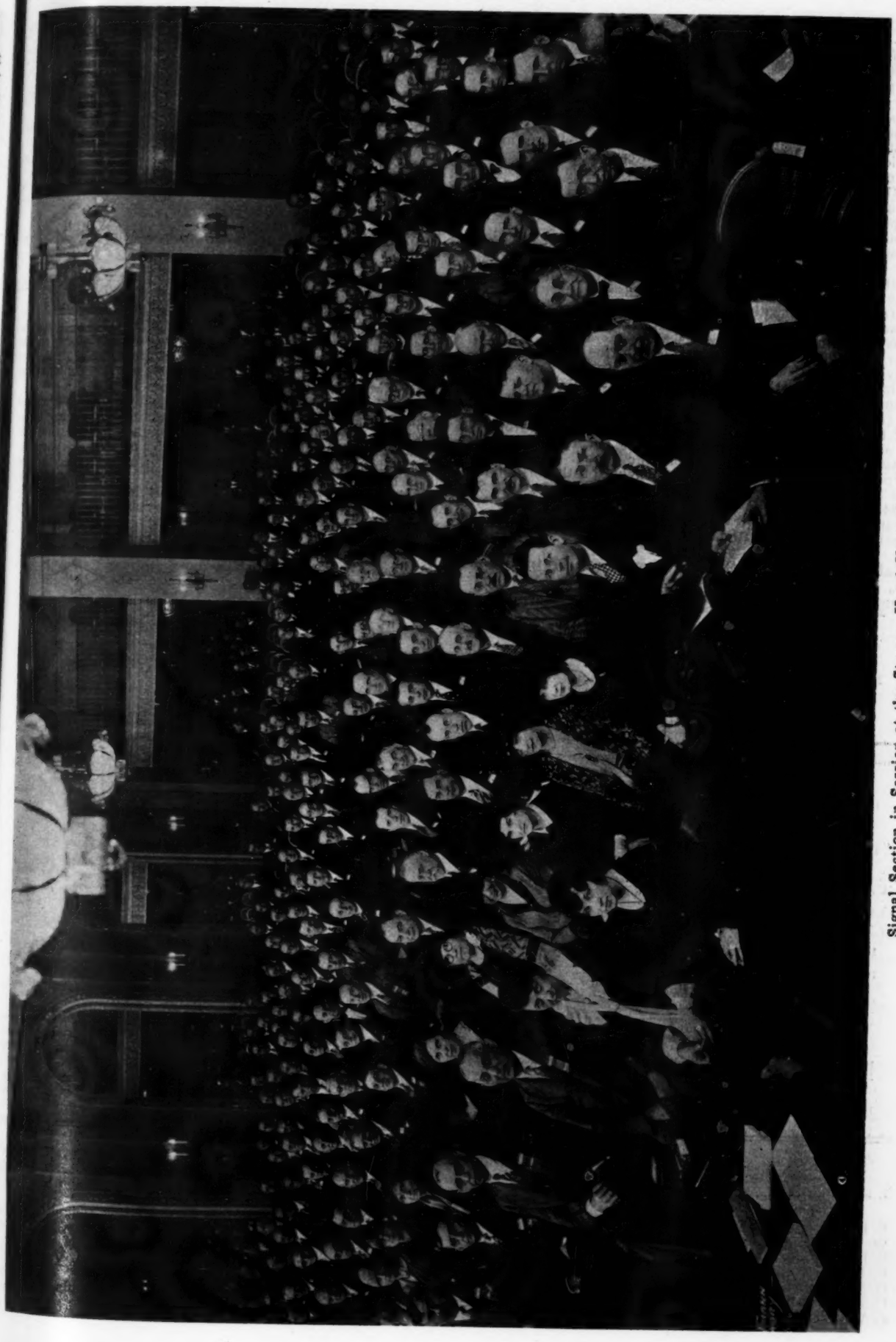
THE eight subjects reported on by the Committee on Economics of Signaling dealt with such diversified applications as spring switches, signaling, interlocking and dispatcher-control systems, the economic benefits of which were clearly set forth. The report on spring switches was based upon the information received in answer to a questionnaire circulated among the roads which have had extensive experience with such installations. The remaining economic studies in the committee's report were presented in a uniform way to make it easy to grasp the essential figures, such as first cost, annual operating cost (including all capital charges), annual net saving, and return on investment (above 6 per cent interest charges). All of the material submitted in the report of this committee was presented for information only. In addition to the report, which follows, C. A. Mitchell, superintendent of the New York, New Haven & Hartford, at Hartford, Conn., presented an illustrated paper on "The Operating and Economic Advantages of Power-Operated Switches, Signals and Car Retarders at Freight Classification Yards."

Spring Switches—Their Economic Value

The report on spring switches included a tabulation of the information submitted in answer to an inquiry sent out in January, 1928, to 77 Class I roads. Answers to the inquiry were received from 66 roads, 22 of which reported the use of spring switches. The economic value has been considered under two heads:

(1) Saving effected by the elimination of train stops through the use of spring switches for the operation of switches at the end of passing sidings, at the end of double track and at other points, the switch being thrown by the train passing through it. In these cases the saving is due to the elimination of train stops.

(2) Savings effected by the elimination of operators or switch tenders through the use of spring switches in place of hand operation by other than trainmen. In these cases no train stops are eliminated and the saving is due to the saving in labor through the release of operators or switch tenders.



Signal Section in Session at the Stevens Hotel Yesterday Morning

Table I showed that 164 installations of spring switches, by eliminating train stops and releasing men, have effected substantial economies at a net saving per annum of over $300,000.

(a) One road with 42 installations (9 at the ends of double track, 16 on passing sidings and 17 at other points) reported the elimination of 74,277 train stops per year, resulting in a saving of $58,367.56. The total cost of the installation was $11,282, or an average of $269 per installation. With annual charges (maintenance, operation and interest) deducted, the net saving per year is $56,559.56.

(b) One road with 18 installations (5 at the ends of double track, 7 on passing sidings and 6 at other points) reported the elimination of 46,786 train stops and 8,760 hours labor saved in the time of operators and others, resulting in a total saving of $35,404. The cost of the 18 installations was $19,100, or an average of $1,061 per installation. The annual charges were reported as $2,996, the net saving per year being $32,408.

(c) One road, with an installation at the end of double track, eliminated no train stops on account of the switch having been handled previously by operators. With the spring switch, operators were eliminated, resulting in a saving of $5,688. The annual charges (maintenance, operation and interest) were reported as $150, and the cost of the installation as $467.85, or a net saving of $5,538 a year.

(d) One road with an installation of one spring switch at the end of double track eliminated 2,920 train stops, at a saving in wages of $617.40 a year. The total saving on this installation is $4,738.80, and the annual charges were reported as $274.70, making a net saving on the installation of $4,464.10 a year. The cost of this installation was $1,984.69, evidently due to the installation of two one-arm signals operated by track circuits in connection with the spring switch installation.

Table I—Record of Spring Switches in Main Tracks

No. Roads Reporting		Items	
22	1.	Number of installations:	
		(a) End of double track	58
		(b) Passing sidings	46
		(c) Other points	74
		(d) Total number of installations	178
22	2.	Type of devices:	
		(a) With spring only	29
		(b) With spring and oil buffer	141
		(c) With spring and air buffer	8
		(d) Type of target used:	
		1 road—various types	
		3 roads—special	
		5 roads—signal installation	
		8 roads—standard	
		1 road—banner	
		4 roads—no report	
18	3.	Train stops eliminated:	
		(a) Average number per day	1,061.88
		(b) Average number per day per road	58.99
		(c) Average number per year all roads	387,586
18	4.	Saving in time, overtime, coal and labor:	
		(a) Time saved per stop, average minutes	6.99
		(b) Time saved per year, total train hours	44,304
		(c) Overtime saved per year, total crew hours (12 roads report overtime saved, 6 roads no overtime saved.)	12,413
		(d) Average value per overtime crew-hour	$5.88
		(e) Average coal saved per stop, pounds	370
1		(f) Average oil saved per stop, gallons	25
13		(g) Coal saved per year, all roads, tons	64,082
1		(h) Oil saved per year, gallons	27,375
14		(i) Average price per ton of coal	$2.84
		(j) Average price per gallon of oil	$0.03
		(k) Average price of electricity per unit per stop	$0.43
		(l) Labor saved (operators and others), hours per year all roads (8 roads report saving, 7 roads no saving, 3 roads information not shown.)	94,567
	5.	Gross saving per year:	
12		(a) Overtime saved all roads	$ 72,842
12		(b) Coal saved all roads	173,480
1		(c) Oil saved	821
1		(d) Electricity saved	6,592
11		(e) Wages saved, all roads	68,763
19		(f) Total saving, all roads	$322,498
19	6.	Annual charges (maintenance, operation and interest) All roads—deduction	$ 21,862
19	7.	Net amount saved per year, all roads	$300,636
19	8.	Amount saved per year, per installation: Average all roads (Based on 164 installations, 14 installations reported with no other information shown.)	$ 1,689
19	9.	Cost of installation, all roads	$ 89,925

The roads reporting installations include: The A. T. & S. F., B. & O., C. of G., C. & O., C. & A., C. & E. I., C. & N. W., C. M. St. P. & P., C. R. I. & P., C. C. C. & St. L., D. L. & W., F. E. C., I. C., M-K-T., M. P., N. & W., N. P., P. M., S. A. L., T. & P., U. P. and W. & L. E.

Typical Examples of Economic Value of Modern Signaling

(1) New Electric Interlocking Plant at Stanley, Ohio (See Railway Signaling, September, 1928).

The new interlocking plant at Stanley is an all-electric plant with 132 working levers and 152 lever frame. It controls the crossings and connections between two sub-divisions of the New York Central (Ohio Central Lines) and the Toledo Terminal covering an extensive area. Some of the switches are a mile away from the tower.

The new plant not only replaced two similar mechanical plants, but also covers considerably more trackage owing to the extended, enlarged and rearranged yard facilities on the New York Central in this vicinity. While the plant is in yard territory, from 16 to 20 main-line passenger trains operate through it each 24 hr. A typical cross-section of the traffic through the plant each 24 hr. is approximately as follows (routes have been arbitrarily numbered to take the place of layout plan which ordinarily shows this information):

Routes	Freight Trains	Cars
1	1	24
2	1	24
3	10	285
4	16	499
5	2	128
6	3	180
7	3	176
8	12	518
9	12	568
10	2	102
11	4	255
12	10	586
Total, 76 trains		

Routes	Passenger trains	Cars
13	3	14
14	3	13
15	5	36
16	5	36
Total, 16 trains		

Routes	Yard Engines
9	8 trains, 104 cars
8	8 trains, 138 cars
17	5 trains, 325 cars
18	4 trains, 325 cars
Total, 25 trains	

Routes	Light Engines
18	23
17	24
8	8
9	8
Total, 63	

The terminal trainmaster of the New York Central summarizes the operation in this vicinity as follows:

"During the year 1926 we handled a total of 1,497,554 cars; in 1927, 1,514,380 cars; and in 1928 up to October 1 we have handled 1,032,000 cars. During the lake shipping season, about 25 per cent of the total cars handled consist of lake coal, each of which is handled from two to four times. The daily handling runs from 4,000 to 6,000 cars. Including crews engaged

Personnel of the Committee on Economics of Signaling

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in transfer service, we work from 50 to 60 eight-hour trick engines daily. The total capacity of the several yards is approximately 7,000 cars. An average of approximately 22 trains are made up and moved out onto the road daily and about the same number are received from the road and classified either for connections, or, in the case of lake coal, grouped according to lake consignee, of which we have about 75 at the present time, and held for arrival of a boat to handle a particular grade."

Economic Aspects

	Debit	Credit
A—First Cost	$211,000	
B—Annual operation (as compared to former arrangement):		
1. Increased maintenance and repair, labor and material, including long term renewals	$ 10,897	
2. Saving made:		
(a) Train hours saved (101 freight trains daily, three minutes delay saved per train, at $14 per hour)		$ 25,650
(b) Engine hours saved (65 light engines daily, one minute delay saved per engine, at $10 per hour)		3,954
(c) Wages saved account eliminating three operators and nine switch tenders		21,751
(d) Reduction in passenger train delays (16 trains daily)		
(e) Interest on investment at 6 per cent	12,660	
Total		$ 51,355
Deduct	$ 23,557	
3. Annual saving		27,798
C—Return on investment over and above 6 per cent interest charges		13.2 per cent

(2) SAVING MADE THROUGH THE ELIMINATION OF TRAIN STOPS BY THE INSTALLATION OF AN INTERLOCKING PLANT WHERE TWO DOUBLE-TRACK RAILROADS CROSS AT GRADE.

The crossing is located near a union station used jointly by the two roads. It also consists of interlocked switches leading to a freight yard, which involves a considerable amount of shifting movements through the plant. All trains were required to stop before proceeding over the crossing, prior to the installation of the interlocking plant, in compliance with the state law. Trains are now permitted to proceed over the crossing without stopping.

Economic Data

1. Number of trains operated over the crossing from 1-1-25 to 2-16-25	1,807
2. Number of trains stopped before crossing	1,807
3. Average time lost per stop	8 min.
4. Total time lost in the 47-day period	241 hr.
5. Average cost per train hour	$6.86
6. Estimated train hour loss per year based on the 47-day check	1,880
7. Estimated cost of train hour loss per year	$12,897
8. Estimated number of trains per year based on the 47-day check	14,095
9. Average number of cars per train	100
10. Average number of cars delayed 8 min. each per year	1,409,500
11. Number of car days delay	7,830
12. Based on $1.00 per car day loss per year	$7,830
Total loss per year account stops before installations (7 plus 12)	$20,727
INTERLOCKING PLACED IN SERVICE FEBRUARY 16, 1925	
13. Number of trains operated over crossing from 2-16-25 to 4-3-25	1,060
14. Number of trains stopped before crossing	134
15. Per cent of trains not required to stop	87 per cent
16. Based on eliminating 87 per cent of stops—annual saving 87 per cent of $20,727	$18,032
17. Road A proportion of cost of construction of interlocking	$32,182
18. Interest on investment at 6 per cent	$ 1,931
19. Increased cost of maintenance and operation	$ 2,000
20. Increase (total of 18 and 19)	$ 3,931
21. Net annual saving over and above 6 per cent interest charges (16 minus 20)	$14,101
22. Annual return on the investment over and above 6 per cent interest charges	43.8 per cent

(a) No derails are provided in the main tracks of either road.

(b) The average number of trains operating over the crossing monthly is as follows: (Road A) passenger trains 186, freight trains 750. (Road B) passenger trains 403, freight trains 1,480.

(c) This statement does not include any saving which has been made by Road B in eliminating the stops of its trains, nor does it include any of its trains in arriving at the return on the investment.

(d) The cost per train hour as shown in Item 5 represents the cost per hour for fuel, water and lubricants, as practically all freight trains of Road A make their trips without involving overtime.

(e) It will be noted from the above that Road B operates twice as many trains over this crossing as Road A and as their proportion of cost of the plant was considerably less than that of Road A, it would be reasonable to suppose its saving would be considerably more than that of Road A.

(3) SAVING OF THE NEW YORK CENTRAL BY CHANGING THE JOINT MANUALLY-OPERATED INTERLOCKING PLANT AT RAISIN CENTER, MICH., TO AN AUTOMATIC INTERLOCKING PLANT, ELIMINATING THE OPERATORS.

Economic Data

A—New York Central proportion of the first cost of the change	$11,560	
B—Annual cost:		
(a) Reduction in N. Y. C. cost of operation, operators, etc., per year	credit	$2,425
(b) Reduction in N. Y. C. cost of maintenance per year	credit	300
(c) Estimated value of unnecessary train stops avoided by the automatic plant as compared with the manual plant, due to the human element, per year	credit	100
(d) Saving in section man's labor due to eliminating cleaning of derails, operating snow shovels, etc., not necessary with the automatic plant	credit	50
(e) Interest at 6 per cent	debit	694
(f) Total reduced annual cost	credit	$2,181
C—Net return on increased investment (over and above 6 per cent interest charges) 18.9 per cent.		

(4) ECONOMICS OF NEW INTERLOCKING PLANT AT THE EAST END OF GIBSON, IND., YARD (NEW YORK CENTRAL).

A—First cost	$57,200	
B—Annual cost:		
1. Material, maintenance, repair and renewal	debit	$ 1,500
2. Labor, maintenance, repair and renewal	debit	3,416
3. Labor of operators saved, one hour per day per trick, 3 tricks	credit	693
4. Train and engine-hours saved:		
(a) Hump and east end engines, 2 hump engines one hour per day and 2 yard engines, 30 min. per day, $12 per hour, total	credit	6,570
(b) Western & Illinois division trains, 6 min. per day Western division and 5 min. per day Illinois division—6 Western division trains and 10 Illinois division trains, $12 per train-hour	credit	6,278
(c) 21 I. H. B. industrial crews per day, average saving of 5 min. per crew, $12 per hour	credit	7,665
(d) Interest at 6 per cent	debit	$3,432
5. Net annual cost	credit	$12,858
C—Return on investment 22.5 per cent.		

(5) SAVING EFFECTED BY THE INSTALLATION OF AUTOMATIC BLOCK SIGNALS REPLACING MANUAL BLOCK SIGNALS—CRESTLINE, OHIO, TO BEREA—63.2 MILES OF DOUBLE TRACK, CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.

Economic Aspects

A—First cost	$237,000	
B—Annual cost:		
1. Freight train data. The saving in freight train-hours was established by making a comparison for a two-week period after the installation of automatic signals with a similar period prior to their installation (under the manual block system) during which period all operating conditions, including number of trains, except the change in signaling systems, were the same.		
(a) Before installation of automatic block signals, October, 1919: Eastbound—Galion to Linndale=292 min. Westbound—Linndale to Galion=351 min.		
(b) After installation of automatic block signals, April, 1922: Eastbound—Galion to Linndale=227 min. Westbound—Linndale to Galion=268 min.		
(c) Time saved on account of automatic block signals: Eastbound—Galion to Linndale=65 min.=1.08 hr. per train. Westbound—Linndale to Galion=83 min.=1.38 hr. per train.		
(d) Based on business of October, 1919—Total freight trains per year: Eastbound—Galion to Linndale=3,672 through freight trains. Westbound—Linndale to Galion=3,684 through freight trains.		
(e) Hours saved per year: Eastbound —1.08×3,672=3,966 hr. Westbound—1.38×3,684=5,084 hr. Total=9,050 hr.		
(f) Approximate value of train-hours saved:		
(1) About 10 per cent on overtime using H-10 engines; value per overtime hour of engine and crew about $15.98....905×$15.98	credit	$ 14,462
(2) About 90 per cent not on overtime; average value per hour of engine $10.32.... 8,145×$10.32	credit	$ 84,056
(3) Per diem saved (car-days) at $1	credit	$ 23,000
(4) Car repairs saved on account avoiding stops	credit	
(5) Engines saved	credit	
(6) Repairs on engines saved	credit	
(7) Miscellaneous benefits	credit	
(8) Total	credit	$121,518
2. Other data:		
(a) Operators saved (four)	*credit	$ 6,240
(b) Increased ordinary maintenance and operation expense per year on account of signals	†debit	5,674
(c) Interest at 6 per cent	debit	14,220
(d) Better passenger train performance	credit	
3. Net annual cost	credit	$107,864
C—Annual return on the investment (over and above 6 per cent interest charges) 45.5 per cent.		

(6) SAVING DUE TO REPLACEMENT OF OIL BY ELECTRICITY FOR LIGHTING SIGNAL LAMPS ON ITHACA BRANCH OF THE DELAWARE, LACKAWANNA & WESTERN.

While improved visibility cannot be evaluated, yet this is the greatest benefit derived from the change made. Seventy-five oil lamps on 73 automatic semaphore signals protecting single track between Owego, N. Y., and Ithaca were replaced by new reflector lamps with 3.5-volt, 0.3-amp. electric bulbs, wires in galvanized conduit, four cells of primary battery per lamp. The lamps are approach lighted, this control being effected by special relays connected in series with the line control relays already in use. It was necessary to run but little additional line wire.

A—Cost of installing new lamps, wiring, battery, etc., and removing old lamps		$4,284.31
B—Cost of maintenance and operation (per annum):	Added	Reduced
1. 120 battery renewals at $1 net	$120.00	
2. 30 lamp bulbs at .375	11.25	
3. Labor renewing battery and inspecting	238.96	
4. Oil, wicks, globes and waste		$ 101.25
5. Labor on oil lamps		979.44
6. Allowance for replacement	192.98	
7. Total	$563.19	$1,080.69
8. Net saving—maintenance and operation		$ 517.50
C—Interest at 5 per cent on $3,859.64 net capital invested	$192.98	
D—Net saving after deducting interest		$ 324.52

E—Annual return on the investment (over and above 6 per cent interest charges) 7.57 per cent.

*The operators saved were few in number for the reason that the intervening interlocking plants enroute included various railroad crossings which were also used as manual block stations. Eliminating the manual block necessarily did not eliminate the operators on account of the remaining duties.

†Increased maintenance is small due to the fact that maintenance force at existing interlocking plants enroute were able to take over the additional duties, except that it will be necessary to add one helper.

(7) DISPATCHER-CONTROLLED SIGNAL INSTALLATION ON THE NORFOLK & WESTERN.

1. The signaling was installed on the 6 mi. of single-track line between Cloverdale, Va., and the end of double track at North Roanoke, being controlled from the dispatcher's office at Roanoke, 2.5 mi. from the end of double track. As A. P. B. position-light automatic block signals were already in service, the only additional units installed were one electro-pneumatic Type A-1 switch movement with dual-selector control at North Roanoke, one 2-position light unit for converting a 1-arm ground signal into a 2-arm ground signal, and illuminated "Take Siding," "Leave Siding" and "Hold Main" signals at Cloverdale. The passing siding switch at Cloverdale remained hand-operated.

2. Average number of passenger trains daily	4
3. Average number of freight trains daily (70 cars)	12
4. Saving due to operators transferred (per year) (No other saving claimed for new signaling.)	$5,940.00
5. Cost of maintenance, operation, and interest on the investment—per year	1,500.00
6. Net saving on investment—per year	4,440.00
7. Approximate cost of new signaling	15,000.00
8. Return on the investment (over and above interest charges)	29.6 per cent

Car Retarders Facilitate Operation in New Haven Yard

By C. A. Mitchell
Superintendent, New York, New Haven & Hartford, Hartford, Conn.

Hartford, Conn., is an important receiving and distributing point on the New York, New Haven & Hartford, because seven diverging routes lead to and from an intensive industrial territory. Also located in the terminal district are two city freight houses and a transfer platform each 1,300 ft. long; 160 private sidetracks serving approximately 200 individual concerns, the majority of which are served off heavy traffic main tracks.

Prior to 1925 the freight yard facilities consisted of three separate yards, the classification tracks being used for receiving and departure of trains, as well as for classification purposes. Two of these yards were located at East Hartford, three miles east of the principal yard. This interchange between the two yard layouts was made over a gauntlet bridge spanning the Connecticut River, the movements being controlled by signals from an interlocking tower. To avoid congestion in heavy traffic periods and to expedite the movement of freight, the three yards were consolidated in 1925. The Hartford yard proper was enlarged and modernized including the installation of a hump, which was put in service in the autumn of that year.

The new yard was provided with 19 classification, 5 rip and storage tracks, also 6 receiving and 6 departure tracks. To the original layout six classification and two long receiving tracks have been added. The arrangement of these six tracks is rather unique in that they extend almost at right angles toward the east to serve eastward traffic for Boston, Providence and Worcester.

Instead of installing an east and westbound hump, as is often thought necessary, the hump at this point serves traffic to the north, east, south and west, or to the seven diverging routes spreading out the terminal and the industrial districts. To conserve highly valuable land, the receiving and departure tracks are parallel to the hump and run-around tracks are provided so that northbound cars can be pulled from the classification tracks around the hump to the departure tracks without the necessity of going over the hump, or pulling out from the extreme south end of the classification tracks.

Retarders Installed in 1926

In the autumn of 1926, power machine switches and retarders were placed in service, this being the first retarder installation east of Chicago—it was also the first yard to operate switches and retarders with only two control towers. On the 26 tracks now in service, there are 25 power-operated switches, 37 car retarders and 26 skates, operated from two of the ultimate three towers. Tower-A is located near the hump and attached to the general yard office, elevated for proper view, and controls 10 switches and 11 retarders, while tower-B, further down the yard, controls 22 switches, 26 retarders and 26 skates. Thirty-five of the retarders are 33 ft. in length, and two, 40 ft.

The gradient of the yard was laid out to maintain an average speed at medium temperature of from five to eight miles per hour on the ladder tracks, and this speed tapers off to about three or four miles per hour on the respective classification tracks. All of the switches, retarders and skates are electrically operated.

Volume of Traffic and Time Saved

From 850 to 1,200 cars move over the hump daily and to expedite the movement of this traffic, make quicker connections with out-going trains and industrial drags and earlier placement in the terminal, three daily shifts of hump engine service are required.

When not engaged in actual humping, the humper engine is used for other yard work, such as caboosing trains, making up local trains in station order, switching repair tracks, assisting in freight house work, pushing road trains and at times assisting in passenger yard switching.

A time study of the actual operation with retarders, as compared with riders, was made using the last seven months of rider operation in 1926, as compared with seven months of retarder operation in 1927. These periods were used in order to eliminate unusual conditions during the construction and introductory periods of operation.

On account of variations in the density of traffic, differences in general methods of operation, with

the variations in the use of the humper engine during spare time, a time study of actually classifying cars was decided on, which means the time from the moment the first car of a drag was high at the hump, until the last car had left the hump. The result of this study indicated an average of 47 sec. per car with riders as compared with 29 sec. per car with retarders, that is a saving of time of 38 per cent. This results in less humping engine time and faster car movement. With rider operation, almost one-half the time charged to actual humping operation was consumed in waiting for riders. This could have been overcome by adding riders if traffic warranted, but which would have been uneconomical.

The limiting feature of retarder operations is the capacity of the last tower operator to handle the large number of switches, retarders and skates assigned to him. Again, if traffic warranted, an additional tower would increase the capacity.

Cost of Operating and Accidents Reduced

A study of the two methods of operation with regard to accidents, including the cornering of cars, derailments, men and equipment failures, miscellaneous and unreported, developed that for the nine months of rider operation there were 59 such irregularities costing $4,562. For the first nine months of retarder operation there were 40 instances, costing $1,106, and in the last nine months of 1928, there were 33 occurrences, approximately a cost of $500. The car damage for nine months of 1928 was $2.19 per 1,000 cars humped.

The retarder maintenance costs for last year, including power and wages of one maintainer and two helpers, were approximately $10,600, or about $24 per retarder per month.

During the seven months of observation in 1928, the payroll expense of the humper crew, exclusive of the riders, was approximately $10,000 less than for the corresponding period in 1926, and furthermore the crews were also available during part of the time for other yard service. The cost of riders was approximately 13 per cent per car, which expense is now eliminated.

No figures are available as to the damage to freight under the different methods of operation and as there were no personal injuries under the rider operation, no credit is taken on these items.

No credit has been taken for the speeding up of the movement of cars and the saving in per diem, but with the new facilities, including the hump yard and retarders, there has been a decided advancement in the movement of traffic with no congestion. Road train schedules have been re-arranged and improved and several yards relieved of classifications, resulting in an improved service to patrons for which the retarder installation should be given abundant credit.

Retarders Effect Economies on Norfolk & Western

By D. F. Peters
Superintendent, Norfolk & Western, Portsmouth, Ohio.

Prior to the installation of the car retarder system in the Portsmouth, Ohio, yard it was necessary, under normal conditions, to operate three shifts with a force consisting of a conductor, 27 car riders, 4 switchtenders, and a motor-car operator. The labor cost of operating the hump during the 12 months' period prior to the installation of the retarder system amounted to $234,132.85. For a similar period since the retarder system has been in operation, the labor cost amounted to $93,291.16, a difference of $140,841.69. The average labor cost per car humped during the 12 months' period prior to the installation of the retarders was 38.2 cents, and during a similar period since the retarders have been installed the per car cost for labor was 13.9 cents. The above figures covering cost of operation with the retarder system include the cost of the maintenance force used for maintaining the retarder facilities.

In addition to an apparent saving in labor costs a gratifying saving has been made by the elimination of personal injuries. During the 12 months' period prior to the installation of the retarder system, 10 employees were injured on the hump, several injuries being very serious; during the 12 months' period since the retarder system has been installed there has not been a single personal injury on the hump.

Since the retarders have been installed on this yard it has been possible to speed up the movement of coal loads through Portsmouth terminal owing to the fact that it is not necessary to stop cuts waiting for riders to return to apex of the hump.

Economic Study of Boston & Maine Hump Yard

By R. J. Hammond
Assistant to President, Boston & Maine, Boston, Mass.

The Boston & Maine has three retarder-equipped yards, two at Boston, Mass., and one at Machanicville, N. Y. The Mechanicville yard offers the best opportunity for comparisons, as it was originally a car rider hump yard, retarders having been put into service on December 10, 1927. Mechanicville yard receives from 700 to 1,500 cars per day, with a daily average slightly in excess of 1,000 cars during 1928. The hump is operated 24 hr. a day and the normal crew consists of 10 men per trick, the cost running $204.27 per day.

The hump crew "cabooses" all trains, doubles trains, and reswitches the local tracks into station order. During times of slack business it is also used for making interchange deliveries, enginehouse switching, etc. During times of peak traffic, additional hump engines are used, each additional engine having a foreman and helper. If necessary two retarder operators can work in each tower, the control boards being designed for this.

As much of the switching formerly handled at the lower end of the yard is now done over the hump, a comparison must be based on the entire yard operation, which unfortunately includes industrial work. The net savings effected in 1928 amounted to $231,480, and the retarders, together with the changes in layout cost $464,561, thus the cost of the work will be paid in two years. The cost per car humped averages about 20 cents per day, with a low value of 14.3 cents in October.

This saving is not all to be credited to the installation of retarders, since the changes in the track layout and the gradients necessary for an economical retarder installation also made a more economically-operated car-rider yard. This was due to the shorter ride, the new layout permitting riders, after bringing the cars to proper speed, to leave the cars at the clearance point of the classification tracks, shortening the average ride approximately 1,150 ft. Three months' operation with car riders indicated that about 1/3 of the savings should be credited to the changes in track layout and gradients.

In addition to this, we were enabled, by the speeding up of switching, to make additional classifications, reducing the amount of work at other yards, increasing our car-miles per day, and improving our service.

While Mechanicville only receives from 700 to 1,500 cars per day, it has a switching capacity many times in excess of this. By actual test, we know that 240 cars per hour can be put over the hump and we have switched 184 cars per hour, including the time necessary to get cars to the hump, trim tracks, etc. We also know from actual operation that we can maintain a switching speed of 150 cars per hour, including all operations.

This indicates the possibilities of retarders at medium-size yards handling from 800 to 2,000 cars, as well as the handling in one yard of cars moving in opposite directions.

Discussion

[Chairman J. E. Saunders (D. L. & W.) presented the report and introduced F. W. Pfleging (U. P.), who submitted that part dealing with spring switches.]

Mr. Pfleging: We have reports of 200 spring switches having been sold within the last 6 months. We have also received one notice from an electric line where the superintendent stated that they had lengthened out their passing tracks to a mile or a mile and a half, setting them at alternate ends and going through these switches at 50 m. p. h. We have had numerous inquiries as to what the speed restriction was. The speed restriction on the spring switch has been placed at whatever the turnout required; but not to exceed 15. There was no reason that other than the turnout restriction should be adopted, as where they are facing the points they are fully protected by automatic signals and should be as safe as the ordinary hand-thrown switch.

[B. J. Schwendt (N. Y. C.) submitted the report on "Typical Examples of the Economic Value of Modern Signaling."]

Mr. Schwendt: There were so many interlocking plants in this territory (Crestline, Ohio, to Berea, 63.2 mi. of double-track line on the Big Four) at which points there were already located maintenance men that it was necessary to add little help when the automatic signals were put through. The duties of the exisiting men were extended.

I was talking to Superintendent J. J. Brinkworth of this division of the New York Central regarding equipment damages, and I believe he can say something to you indicating that there are many items of economy which are not reported on. They are scattered and difficult to get at; but not intangible.

J. J. Brinkworth (N. Y. C.): We have gone through another year of centralized control. We are better satisfied than ever that it is a good thing. Just before I left the office yesterday, I asked the dispatcher to give me a few notes of what was going on. It is interesting to me and will be to you:

"January 13, 1927. (Before centralized control.) Second 93 remained at Hatton one hour and 56 minutes. Extra 212 south remained at Wayne two hours for passenger trains 39, 41 and 43, on account of the rear end of second 93 missing 19 order which was being handed on at Hatton. It was necessary to back up and get it, and then the time was too short for them to get out ahead of the three passenger trains."

Here is what is happening now:

October 1, switchman reported through the B. & O. crossing operator that a wheel was sliding on the 65th car from caboose on extra 9739. Signals were set against them and the train stopped, and the crew notified who found car off center." On the efficiency end of it: "Extra 219 north lined up to take siding at Story Ridge for second 40 passenger train due to leave Toledo at 9:10 a. m. After extra 219 passed Lucky, the dispatcher received information that second 40 was later than anticipated. He immediately changed the route and ran 219 to Stanley for second 40, saving 50 min. delay to that train."

I have a number of other similar cases of that kind which are happening every day. Nowadays 75 to 125-car trains are being operated all over the country. One of the difficult features of handling trains is that we have too many equipment failures, broken draw bars, and broken couplers, and so on. "Equipment failures in the territory between Berwick and Stanley, the centralized control district, as between 1927 and 1928, were reduced 72 per cent." In 1927 we had 43 equipment failures; in 1928 we had 12 in that particular district. All of this brings to my mind the absolute necessity for the closest kind of relationship between signal men and operating men. I do not mean co-operation; but rather co-ordination.

J. C. Mock (M. C.): I am not sure it was brought out clearly that there was a difference in the number of equipment failures. Was it due to the fact that they did not have to stop the train so much?

Mr. Brinkworth: About 70 per cent are being made without either train stopping. If a train is stopped even with the most careful handling of the air, you are liable to do some damage.

[C. A. Mitchell (N. Y. N. H. & H.) then presented a paper on the classification yard on the New Haven at Hartford, Conn. Next R. J. Hammond (B. & M.) presented a paper describing the operation of the Boston & Maine's retarder-equipped hump yard at Mechanicville, N. Y. These papers are given in abstract herewith. Then R. B. Elsworth (N. Y. C.) referred briefly to three installations on the New York Central.]

Mr. Elsworth: On the New York Central there are three installations; two of them new in service, and a third one to be placed in service this month. One is located in Selkirk, N. Y. It has been in service for two years. The two others are at DeWitt, N. Y., which is the yard just east of Syracuse and which handles switching for the central part of the road. At Selkirk there are 33 retarders totaling 1,000 lin. ft. On the western hump at DeWitt there are 17 retarders, equivalent to 654 lin. ft. On the eastern hump there are 32, equal to 1,232 lin. ft. There are 25 switches at Selkirk and 60 at DeWitt. The switches at Selkirk are all single switches; that is, the point of the second switch is outside of the frog of the first switch, while at DeWitt we have 8 cases where the switches are lapped. We hesitated before installing a lapped switch, but our practice so far has shown that it causes no trouble.

A track circuit for the purpose of preventing throwing the switch beneath the car is installed on all switches and with the special circuit installed we have had no cases of the switch being thrown beneath the car. Although the major advantage of that is the avoiding of the delay due to derailments and repairs, the actual advantage is that the operators will move the cars over the hump faster with the switch protection, because we know they are safe, while if it is left up to their observation and judgment, they will delay throwing the switch if the car is close. Now they can work just as close as the cars come. We have as yet no definite information as to what the saving is going to be at DeWitt. We are sure that we are going to take 150

men off the payroll on those two humps before we get through. The one particular saving that we accomplished at Selkirk, which was not anticipated, was the question of the yardmasters. No one had contemplated taking yardmasters off, but it developed after we got rid of switchmen and car riders and only had the three operators and conductors there was nothing for the yardmaster to do.

These savings as brought out by Mr. Mitchell, do not include the overhead that goes with carrying a man on the payroll. We have a great many departments in a railroad, such as the claim department, welfare department, pass department, etc., all of which have some expense in connection with the men on the payroll, and none of that is included in the figures submitted.

[D. F. Peters (N. & W.) then presented a paper describing the operation of the retarder-equipped yard at Portsmouth, Ohio, which is shown herewith in abstract. Chairman Saunders then called upon H. G. Morgan (I. C.) to describe the operating performance of the three yards on the Illinois Central.]

Mr. Morgan: The Illinois Central has operated three yards with retarders for three years. These yards have approximately one mile and one-half of track retardation. The amount of retardation might be reduced in the present state of retarder development owing to the improved braking power resulting from the use of steel shoes and to improvements in the design of retarders themselves. The grouping of retarders is also a factor in the amount of retardation required. It is obvious that concentration of retarders at the bottom of the hump will permit faster movement over the hump, and concentration of the retarders on the hump itself will reduce the amount of apparatus required, because all cars pass over these retarders.

Estimated figures based on our experience with retarders indicate there has been a saving in operation and an increase in yard capacity. The East St. Louis yard was operated with flat switching prior to 1926, and the installation of the hump yard with retarders has reduced yard costs 17 per cent. It is our experience that the use of car retarders will effect savings where there is a large amount of business to handle, and will permit the speedier handling of business. They will also permit operating in bad weather and will reduce damage to equipment.

F. W. Bender (C. R. R. of N. J.): We have an electro-pneumatic plant at Allentown, Pa., where we handle a rather diversified traffic, and we had unusual physical limitations which prevented us from installing a symmetrical retarder installation. We make 47 classifications, some requiring 2 tracks, on 24 classification tracks.

The yard was constructed in 1906, and the retarders were added in 1927, in order to handle the increased volume of traffic. At this yard, we have 5 tracks in the receiving yard, averaging 2,000 ft. each, 1 hump track, and 24 classification tracks of 100-car capacity, averaging 2,300 ft. each. There are no departure tracks, the classification tracks being used for departure tracks.

We handle from 850 to 1,000 cars, or about 24 trains, per day. The classifications average 18 cars, with 65 cuts per 100-car trains. Twenty trains depart daily and the average time between arrival and departure of cars is 10½ hours. The lading is principally coal and coke, with merchandise and steel second in volume. The retarder operation has eliminated 55 riders and switchmen, also one engine.

While detailed figures showing the cost of the old method as compared with the new method of operation are not available, these figures are now being prepared and show, roughly, about $350 saving per day, or about 40 cents per car. This, however, does not take into consideration the saving which results from the elimination of personal injuries and engine terminal repairs. Neither does it cover the increased speed with which we can deliver the cars to the customer, nor anything to cover per diem. We are saving money and at the same time are getting the cars to destination much quicker.

E. P. Weatherby (T. & P.): Our yard at Ft. Worth, Tex., is entirely new, so we have no figures for comparing the old operation with the new. However, we have found that the expense of handling the cars through Ft. Worth is slightly lower. Our expenses at adjoining yards have been greatly reduced because most of the classification is now being done at Ft. Worth, which was previously done by flat switching at the other yards within 200 miles of Ft. Worth. We find that the trains have been greatly speeded up in passing through Ft. Worth. Our traffic consists of a number of commodities, mostly oil and fruit, and our fruit trains, especially, are speeded up in getting through the terminal.

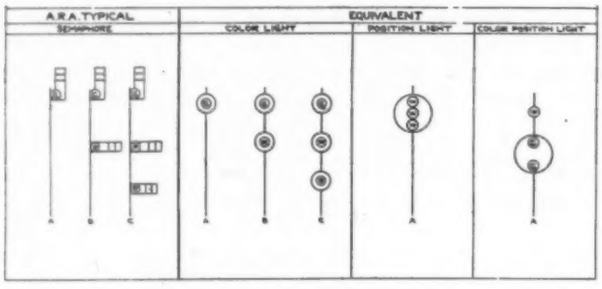
In the Weber Canyon on the Union Pacific

Report on Signaling Practice

First official diagram of aspects and indications for light signals presented

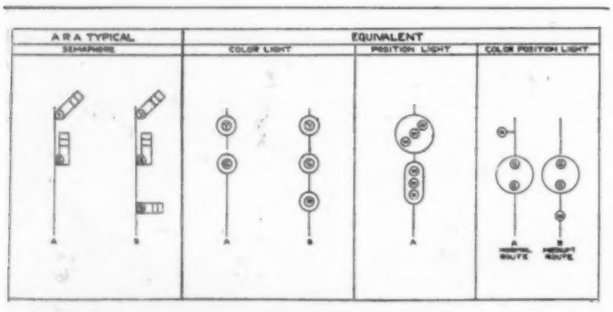
W. M. Post
Chairman

TWELVE diagrams of signal aspects and their respective indications constituted the first section of the report of the committee on Signaling Practice. These drawings covered the application of signals under the A. R. A. Code Rules 281 to 292, inclusive, and showed clearly the A. R. A. typical semaphore signal aspects alongside of the corresponding (and equivalent) aspects of color-light, position-light, and color-position-light signals. The name of each signal aspect, its indication (meaning) and its applications were given in the captions under each chart. In reading the color-light signal aspects, it must be remembered that the letters *G*, *Y* and *R* designate the color, i.e., green, yellow or red, as displayed by the particular color-light unit, which in the diagrams is shown as a circle, but which may or may not comprise as many as three individual colored lights, only one of which is lighted at a time. The one which is lighted is indicated in the diagram by the letter.



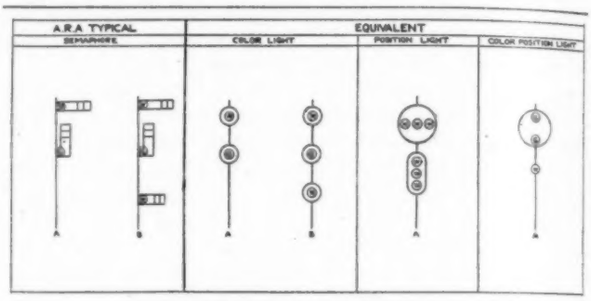
A. R. A. Code Rule 281

Indication—Proceed
Name—Clear
Application—At entrance of normal speed route or block, to govern train movements at normal speed



A. R. A. Code Rule 282

Indication—Approach next signal at not exceeding medium speed
Name—Approach-Medium
Application—At entrance of normal speed route or block to govern the approach to clear-medium, approach, medium-approach, or approach-medium signals

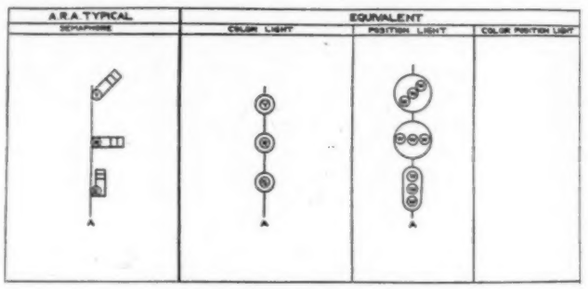


A. R. A. Code Rule 283

Indication—Proceed at not exceeding medium speed
Name—Clear-Medium
Application—At entrance of medium-speed route or block, to govern train movements at not exceeding medium speed

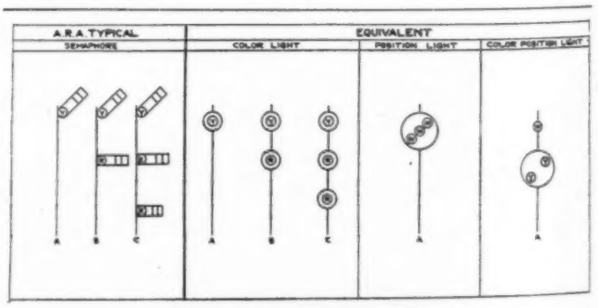
An explanation of the circumstances leading to the preparation of this set of diagrams was given in the report of the committee as follows:

The committee has given consideration to Principles of Signal Indication, Part 68 of the Manual, and Signaling Practice, Part 143 of the Manual. This matter is referred to in the report of Committee X, as published in the 1928 Stated Meeting Advance Notice.



A. R. A. Code Rule 284

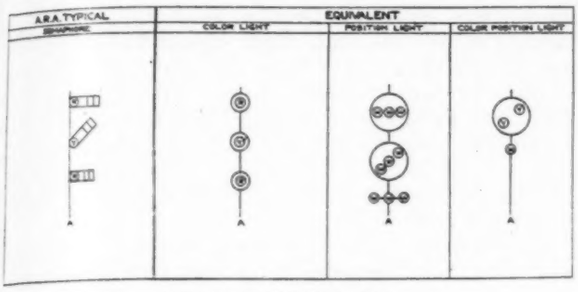
Indication—Approach next signal at not exceeding slow speed
Name—Approach-Slow
Application—At entrance of normal speed route or block, to govern the approach to clear-slow, slow-approach, or restricting signals



A. R. A. Code Rule 285

Indication—Prepare to stop at next signal. Train exceeding medium speed must at once reduce to that speed
Name—Approach
Application—At entrance of normal speed route or block, to govern the approach to clear-slow, slow-approach, permissive, restricting, stop and proceed, or stop signals; red switch lamp and end of signaled territory

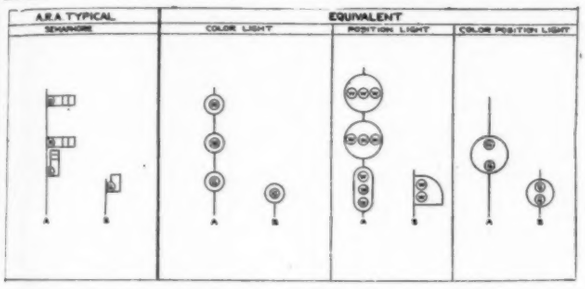
After consideration of all the features in connection with these two subjects, the committee concluded that on account



A. R. A. Code Rule 286

Indication—Proceed at not exceeding medium speed prepared to stop at next signal
Name—Medium-Approach
Application—At entrance of medium-speed route or block, to govern the approach to clear, slow, slow-approach, permissive, restricting, stop and proceed, or stop signals and end of signaled territory

of the preparation of Chapter III in which the principles of signal indication and signaling practice will be clearly defined,

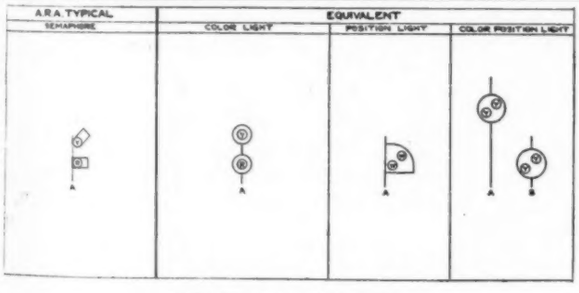


A. R. A. Code Rule 287

Indication—Proceed at not exceeding slow speed
Name—Clear-Slow
Application—At entrance of slow-speed route or block, to govern train movements at slow speed

and as Parts 68 and 143 are obsolete, the removal of these parts from the Manual is recommended.

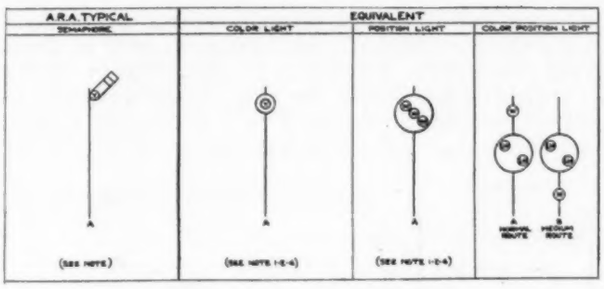
The committee therefore submitted in lieu of Parts 68 and



A. R. A. Code Rule 288

Indication—Proceed at not exceeding slow speed prepared to stop at next signal
Name—Slow-Approach
Application—At entrance of slow-speed route or block, to govern the approach to permissive-restricting, stop and proceed, or stop signals

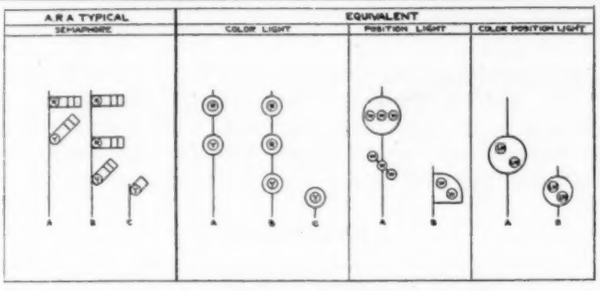
143, a report on the Application of Signals, this report being based on the typical signal aspects as they apear in the A. R. A. Standard Code.



A. R. A. Code Rule 289

Indication—Block occupied, proceed prepared to stop short of train ahead
Name—Permissive
Application—At entrance of a manual block to govern trains entering and using that block
(NOTE): Designate by (1)—Letter plate, (2)—Marker light, (3)—Shape of arm, or (4)—Combination of these distinguishing features

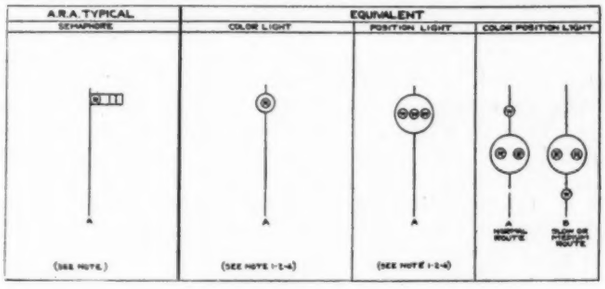
Action recommended: acceptance for submission to letter ballot superseding subject-matter in the Manual.



A. R. A. Code Rule 290

Indication—Proceed at restricted speed
Name—Restricting
Application—At entrance of normal-speed, medium-speed, or slow-speed route or block, to permit trains to proceed prepared to stop short of train, obstruction, or anything that may require the speed of the train to be reduced

The report also included a review of progress and of the Interstate Commerce Commission inspections



A. R. A. Code Rule 291

Indication—Stop, then proceed in accordance with Rule 509-B
Name—Stop and Proceed
Application—At entrance of a route or an automatic block requiring trains to stop and, after stopping, permitting them on two or more tracks to proceed at restricted speed and on single track in accordance with the rules
(NOTE): Designate by (1)—Number plate, (2)—Marker light, (3)—Pointed blade, or (4)—Combination of these distinguishing features

Personnel of Committee on Signaling Practice

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W. J. Eck, asst. to vice-pres., Sou., Washington, D. C.
W. H. Elliott, sig. engr., N. Y. C., Albany, N. Y.
G. E. Ellis, secy., A. R. A., Chicago.
P. M. Gault, sig. engr., M. P., St. Louis, Mo.
J. V. Hanna, chf. engr., K. C. T., Kansas City, Mo.
J. C. Mock, sig. & elec. engr., M. C., Detroit, Mich.
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J. A. Peabody, sig. engr., C. & N. W., Chicago.
F. W. Pfleging, sig. engr., U. P., Omaha, Neb. *Vice-chairman*
A. H. Rudd, chf. sig. engr., Pennsylvania, Philadelphia, Pa.
T. S. Stevens, sig. engr., A. T. & S. F., Topeka, Kan.
E. G. Stradling, supt. tel. & sig., C. I. & L., Lafayette, Ind.
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F. B. Wiegand, sig. engr., N. Y. C., Cleveland, Ohio.
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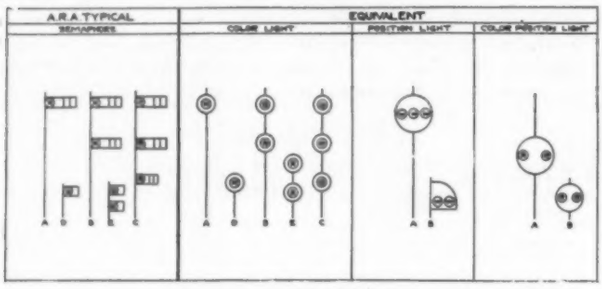
and approvals of automatic train control installations under the commission's two orders as well as those made voluntarily. Each I. C. C. report was presented in abstract form listing the commission's exceptions and detailed requirements as to maintenance, inspection and tests. Reference was also made to the cab signaling installation now under way on the New York division of the Pennsylvania. Abstracts of these reports have been published from time to time in *Railway Age* and *Railway Signaling* and are therefore not repeated here.



A. R. A. Code Rule 292

Indication—Stop
Name—Stop
Application—At entrance of a route or block requiring trains to stop until authorized to proceed by train order, clearance card, more favorable indication than stop, or in accordance with the rules

Discussion

[The report was presented by Chairman W. M. Post (Penna.). F. B. Wiegand (N. Y. C.) stated that J. J. Corcoran (N. Y. C.) had objected by letter to the clause in A. R. A. Code Rule 284, Application, reading as follows: "It is here stated that this aspect is to govern the approach to, clear, slow, slow-approach or restricting signal." On referring the letter to W. H. Elliott (N. Y. C.), it was thought best to have Mr. Corcoran discuss the question before the meeting.]

Mr. Corcoran: The point made here in this indication says "Approach next signal at not exceeding slow speed." This may mean 10 or 15 m.p.h. The next signal may be, under this rule, a restricting signal; that is, a train may occupy a position directly ahead of it. Therefore this signal means no more to the engineman than a stop signal. In my opinion, it is therefore improper to tell them to proceed at slow speed when we mean "speed prepared to stop at next signal."

Chairman Post: Mr. Corcoran's point is well taken.

[*It was moved that the report on the application of signals be accepted for submission to letter ballot, superceding Part 68, Principles of Signal Indication, and Part 143, Signaling Practice, with the correction proposed by Mr. Corcoran.*]

T. S. Stevens (A. T. & S. F.): There are three vital things involved in this report. There are 11 proceed indications. The proposed elimination would take care of one less and that would make 10 proceed indications at roughly 50 m.p.h or between 70 m.p.h and 20 m.p.h., which is about the slowest speed we could consider. I do not believe there is any man living who can go 5 m.p.h If these indications mean anything, that is what must be done.

We are using the dwarf signals. It is a curious thing that Rule 281 provides a semaphore signal which carries a green light, usually installed 25 ft. above the ground. In the equivalent color-light signals it provides one light signal showing green, usually installed about 10 ft. above the ground. Both of these are supposed to indicate "Proceed." In Rule 287, color-light signal B, dwarf signal, displays green about 2 ft. from the ground. I cannot use this signal, however, to indicate "Proceed." I must get the significance of a slow-speed signal, all these three signals using the same light.

This scheme will block the economical progress in signaling, first, because of the fact that a green light does not mean the same thing two feet from the ground that it does five feet from the ground; and the other thing, it is said there is a difference required to tell an engineman to stop for the rear end of a train and that required for him to stop at open switch or broken rail. It is rather difficult for me to conceive of its being possible that a signal system should be blocked in its efforts to do economical work by any action of this body.

C. A. Taylor (C. & O.): We have several locations, such as in yards, where we can use dwarf signals as automatic signals to advantage, since placing regular signals adjacent to the track they govern would be expensive on account of the bridges required. By the use of dwarf signals, there is a saving which warrants the installation, but in every case where we put them in, we have nothing in the Code or A. R. A. manual to cover it and there is always a question raised as to what rule covers this signal.

C. A. Christofferson (N. P.): I was up against the same thing that was brought forward by Mr. Taylor. It was impossible to bridge all the tracks, so I proposed to the operating department that we could put in dwarf color-light signals and give them a normal speed indication through the yard, where normal speed could be applied, and a yellow signal for low speed where that should be applied and they were installed accordingly.

Mr. Wiegand: I will read the note: "Aspects shown are typical. Each road should show the aspects and color of light it gives."

J. E. Saunders (D. L. & W.): In conjunction with our electrification we are going to use low signals for normal speed routes; there is no other way for us to signal, as the catenary supports completely fill the upper part.

R. B. Ellsworth (N. Y. C.): I do not believe it is contemplated by this committee to establish the height of any automatic signal. I do not believe the adoption of this plan will hurt Mr. Stevens any more than the rest of us. We all have the low signals where we cannot get in the high ones. It is standard practice.

Mr. Saunders: Conditions have changed. The brilliancy of the light signal has made it practical to use a lower signal; in fact, it has made it very desirable to use a low signal. Should not we take cognizance of it and indicate here that the actual height of the signal has nothing to do with the speed?

Mr. Post: This has nothing to do with the height of the signal between 14 ft. and 25 ft. It simply differentiates between the dwarf signal and the high signal. There is a difference between a dwarf signal and a high signal.

[*The motion to adopt the report as amended to conform to Mr. Corcoran's suggestion was carried by a standing vote of 104 to 103.* That part of the report relating to automatic train control was submitted by

subcommittee chairman, G. E. Ellis (A. R. A.)]

A. H. Rudd: Last fall the Pennsylvania authorized $1,500,000 for these cab signals between Manhattan Transfer and Philadelphia. About the middle of January we had an accident caused by a collision in the fog. The Interstate Commerce Commission said they thought that on account of the traffic and the dense fog on the Chesapeake, that this was one of the territories which should be given additional protection, where we had automatic signals and that we should either extend our cab signal indications or install automatic stops. Last Wednesday the board of directors appropriated $1,750,000 to put in the cab signals from Philadelphia to Washington. The four-indication coded system will be used. There will be a whistle in the cab that will sound whenever the signal changes to more restricted indication, continuing to sound until the engineman acknowledges it and shuts it off. If the engineman fails, the fireman can take his place and vice-versa.

Report on A-C. Block Signaling

New requirements for range of color-light signals included in specification

W. F. Follett
Chairman

THIS committee submitted a revision of its color-light signal specification which covered electric color-light signals for either automatic block signaling or interlocking plants. In respect to focal adjustment, the specifications provided that: "Correct focal position of the lamp filament must be established for the lens unit. Such focal adjustment must be accurate and must insure uniformly good indication from the type of electric lamp specified." Continuing further the specification stipulated that the range of a color-light signal shall be, "The distance on tangent track at which, under bright sunlight conditions, with the sun at or near the zenith, the signal indication will be clear and distinct to a person with normal vision." Furthermore, the "Range shall be determined with a signal equipped with lens units of minimum horizontal angle of visual spread." Selected sections of the specification which are of technical interest follow:

Electric Color-Light Signal

(6) Design—(a) Type of signal shall be as follows: 1. Tunnel. 2. Outdoor. 3. Dwarf. 4. Take siding.

(b) The signal case shall be metallic, weatherproof, equipped with suitable door or cover having a hasp lug with a minimum opening of 5/8 in. for application of a lock. The door or cover when opened shall provide easy access to all parts.

(c) The door or doors of the signal unit must be so arranged that, when open, any light at the back of the signal will not cause a more favorable indication to be displayed.

(d) The signal shall be of a design approved by the purchaser.

(e) Like parts of manufacturer's apparatus shall be interchangeable.

(7) Lenses and roundels—(a) Lenses and roundels shall conform to Spec. 6918.

(b) The main or objective lenses shall be.....in. in diameter, of the optical design with smooth outer face, having minimum horizontal angle of visual spread of .....deg.

(c) Roundels of the flat type shall be.....in. in diameter.

(d) The lens units to be furnished in accordance with drawing.....

(e) Special wide angle lenses (deflecting prisms) with horizontal angle of spread of.....deg. shall be required to improve visibility of signal on curves.

(f) The lens shall be of such a design as to give a good close range indication.

(g) The type of lens shall be of such design and construction as to eliminate undesirable phantom indications.

(8) Electric lamps—(a) The electric lamps shall be in accordance with Spec. 5115.

(9) Focal adjustment—(a) Correct focal position of the lamp filament must be established for a lens unit. Such focal adjustment must be accurate and must insure uniformly good indication from the type of electric lamp specified.

(10) Range—(a) The range shall be the distance on a tangent at which, under bright sunlight conditions, with the sun at or near the zenith, the signal indications will be clear and distinct to a person with normal vision.

(b) The range shall be determined with the signal equipped with lens units of minimum horizontal angle of visual spread specified in Section 7-e.

(c) Range shall be.....ft.

This specification was recommended for acceptance for letter ballot approval.

Progress in Lightning Protection

As a part of the report of the Committee on Alternating Current Automatic Block Signaling, Edward Beck, of the engineering department of the Westinghouse Electric & Manufacturing Company, presented a paper commenting upon the recent progress in the protection of transmission and signaling lines against lightning. He described briefly two aspects of engineering studies which are now in progress, namely, an investigation of the electrical disturbances caused by lightning and the behavior of lightning arrester grounds when subjected to extremely high voltages. This subject is of great importance in the signaling field because it is intimately related to the problem of maintaining continuity of service. Mr. Beck referred to the development of a sensitive oscillograph utilizing the cathode ray principle as first introduced in this country by DuFour of France. In order to learn more about the mysterious tricks of lightning, instruments of this new type have been installed on high-voltage transmission lines during the past summer with the result that complete oscillograph records of lightning voltages have been secured. This is the first time this result has been obtained.

In respect to the liability to lightning flashover, Mr. Beck stated that investigations disclosed that, "all transmission lines, regardless of the insulation used, are

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G. H. Dryden, sig. engr., B. & O., Baltimore, Md.
E. N. Fox, gen. sig. inspr., B. & M., East Cambridge, Mass.
J. J. Ginty, supt. sigs., C. N., Montreal, Que.
C. E. Goings, sig. engr., Pennsylvania, Philadelphia, Pa.
J. J. Larkin, supt. sig., South Brooklyn Ry., Brooklyn, N. Y.
W. K. Saunders, supvr. sig., R., F. & P., Ashland, Va.
W. L. Scott, sig. supvr., Reading, Harrisburg, Pa.

likely to lightning flashover at times. We are led to the conclusion that the lightning voltages which may occur exceed any insulation which has been used thus far. It is very doubtful that freedom from lightning disturbances can be secured by greater amounts of over-insulation." The author pointed out that the difference between lightning disturbances on high-voltage lines and on 550-volt lines, such as used in railway signaling practice is only one of degree. The disturbances on low-voltage signal lines which are destructive occur more frequently, because these low voltage lines are not sufficiently well insulated to withstand these lightning voltages.

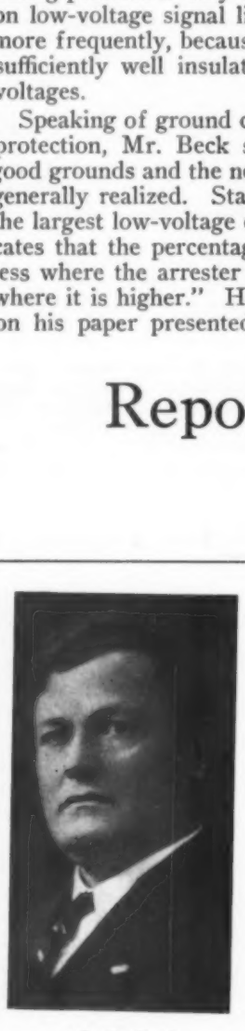
Speaking of ground connections for lightning arrester protection, Mr. Beck stated that "The importance of good grounds and the necessity for checking them is now generally realized. Statistical data collected on one of the largest low-voltage distribution systems clearly indicates that the percentage of lightning failures is much less where the arrester ground is below five ohms than where it is higher." He then continued with comments on his paper presented a year ago before the Signal Section, showing how the resistance of grounds, particularly those treated with electrolyte, will change during a 12-month period. He also referred to experiments which have been made, indicating that grounds of low resistance value, as measured in the usual way, also are of low resistance when subjected to high-potential surges. In general, the resistance is slightly lower under impulse conditions than when determined by the use of a low-voltage ground tester. This leads to the conclusion that, "The resistance indicated by the ordinary measuring means is a good indication of the effectiveness of the grounds under lightning disturbances."

Discussion

[In the absence of Chairman W. F. Follett (N. Y., N. H. & H.) the report was presented by C. E. Goings (Penna.). After discussion by T. S. Stevens (A., T. & S. F.) and F. B. Wiegand (N. Y. C.), Section XI—Aspects and Indications, of the Specifications for Electric Color-Light Signals was changed to read Aspects, following which *a motion to accept the specification was carried.*]

Report of Committee on Contracts

Additions and changes in table of interlocking units and values recommended



G. E. Beck
Chairman

THE committee proposed a number of additions and changes in the A. R. A. table of interlocking units and values as shown in the Signal Section Manual. The committee believes that the units as given in the revised table would cover all contractual requirements. The need of units for use at other than interlocking plants warranted additional units which embrace all signaling facilities. These the committee presented in a new table, as shown herewith. The revised table of interlocking units was presented for acceptance, which would permit its submission to letter ballot to supersede the present sections of the Manual relating to this subject. The new table covering signal units (other than interlocking) was presented for discussion only.

The committee also presented the A. R. E. A. form of agreement for interlocking plants, with the recommendation that it be adopted by the Signal Section, upon formal submission to letter ballot. This agreement form is the one adopted at the annual meeting of the A. R. E. A. on March 6, 1928. A joint meeting of a subcommittee of the Signal Section, Committee on Contracts and the corresponding subcommittee of the A. R. E. A. was held to formulate this agreement. Owing to its length, it was not reprinted in the advance committee reports of the Signal Section, March, 1929, meeting.

Table of Signal and Interlocking Units

Item No.	Function	Units Mechanical	Units Power
1	Signal arm and/or light, non-operated	1	1
2	Signal, complete with mast, blade and/or light, non-operated	2	2
3	Signal, mechanically-operated with switch or derail	1	0
4(a)	Signal, two-indication, semaphore or light	4	4
(b)	Signal, each additional indication	2	2
5	Switch (2 points), derail, or torpedo machine	4	8
6	Slip switch (2 points)	4	8
7	Slip switch (4 points)	8	12
8	Movable frog (4 points)	8	12
9	Derail, pipe connected to switch and operated thereby	1	1
10	Detector bar, 55 ft. in length or fraction thereof	2	2
11(a)	Facing point lock or drawbridge lock	2	6
(b)	Facing point lock operated with another function	1	0
12	Switch and lock movement	1	0
13(a)	Drawbridge circuit controller or pipe coupler	4	8
(b)	Drawbridge circuit controller or pipe coupler operated with another function	2	2
14	Track circuit, complete	0	2
15(a)	Electric lever lock (safety and indication magnets excepted)	0	1
(b)	Electric lock, on hand-operated switch, controlled from block or interlocking station	0	2
(c)	Electric lock, applied to functions 11-a, 11-b and 12	0	1
16	Indicator	0	1

Personnel of Committee on Contracts

G. E. Beck, asst. to sig. engr., N. Y. C., Cleveland, Ohio. *Chairman*
E. T. Ambach, asst. sig. engr., B. & O., Cincinnati, Ohio.
J. M. Carley, sig. estimator, B. & A., Boston, Mass.
W. L. Dayton, supt. sig., G. T. W., Detroit, Mich.
F. French, supvr. sig. shops, M. C., Detroit, Mich.
C. Homewood, asst. supvr. tel. & sigs, Penna., Wilmington, Del.
G. W. Kydd, sig. pilot engr., B. & O., Baltimore, Md. *Vice-chairman*
W. A. Hough, office engr., Erie, New York.
H. C. Lorenzen, asst. sig. engr., P. M., Detroit, Mich.
J. W. MacCormack, asst. engr., K. C. T., Kansas City, Mo.
J. H. Molloy, office engr., C. R. I. & P., Chicago.
A. R. Wolford, asst. engr., S. P., San Francisco, Cal.

17	Annunciator	0	1
18	Electro-mechanical slot	0	1

Table of Signal Units

Item No.	Function	Units Mechanical	Power
1	Skate-placing machine	0	4
2(a)	Car retarder, single rail 32 ft. in length, including operating mechanism	0	16
(b)	Additional 8 ft. of car retarder, or fraction thereof	0	2
3(a)	Car retarder, double rail 32 ft. in length, including operating mechanism	0	32
(b)	Additional 8 ft. of car retarder, or fraction thereof	0	4
4(a)	Highway crossing signal, per mast, bell, wig-wag or flashing light type	0	2
(b)	Additional 2 lights or bell	0	1
5	Highway crossing gates, per post	1	2
6(a)	Train control inductor or loop circuit	0	1
(b)	Train control ramp (energized), magnet or coded circuit	0	2
7	Switch, automatic block signal protection	0	1
8	Switch indicator	0	2
9	Grade signal, operative	0	1

Discussion

[Chairman G. E. Beck (N. Y. C.) presented the report and in doing so referred to suggestions which the committee had received subsequent to the Atlantic City, stated meeting in September, 1928.]

Chairman Beck: We understood at the Atlantic City meeting that we could not use the word "values"; therefore we changed the title to "Table of Signal Units." Since that time, I have received a letter suggesting that we change back. The committee at this time would like to change the title to read, "Table of Signal and Interlocking Units," the first column to read "Items No.," the second column to be changed from "Function" to "Units," and the heading of the third column to read "Unit Values." The committee desires that the table as revised be accepted, and the criticisms which the committee has received go over into the work of next year. We feel that the Table of Interlocking Units and Values as proposed will give you all that you need.

[At this point some confusion developed regarding the clarity of the committee's table of unit values, particularly as to the idea of changing it by removing the classification provided under the last column of the table, namely: "Power." A. H. Rudd (Penna.) suggested that the table be left as printed in the advance bulletin, because in that form it would be less likely to be misconstrued. *His motion to this effect was carried.* Then chairman Beck moved that the table of Signal and Interlocking Units be accepted for letter ballot approval. *His motion was carried.* Chairman Beck then submitted the Table of Signal Units (other than signals and interlockers).]

[Chairman Beck next called attention to the A. R. E. A. "Form of Agreement for Interlocking Plants" and referred to numerous minor changes.]

J. C. Irwin (B. & A.): I want to endorse Mr. Beck's position in connection with this, as chairman of the committee of the A. R. E. A., which is handling this subject. Those changes that were made were made jointly by committees of the Signal Section and of the A. R. E. A.

[Chairman Beck then moved that this form of agreement be accepted for submission to letter ballot. *His motion was carried.*]

Report on Overhead and Underground Lines

Specifications for insulated wire and parkway cable excite interesting discussion

G. H. Dryden
Chairman

A REVISED specification covering rubber compound, insulated signal wire, specifications relating to pole line hardware, and another covering parkway cable for signal use were included in the report of this committee. Five obsolete specifications were recommended for removal from the Manual. The wire specification provided for physical and chemical tests, which would have to be carried out in a laboratory, the chemical tests relating largely to the testing of the rubber compound insulation. Similarly the mechanical tests specified covered largely tests of the insulation. In addition, two electrical tests were specified, namely, a high-voltage breakdown test and an insulation resistance test. The specification covered insulated wires for signal circuits up to 660 volts. The committee recommended the acceptance of the specification for letter ballot approval.

Parkway cable for signal purposes was provided for in another specification submitted by this committee. As in the case of the insulated wire specification, the parkway cable specification covered cables for service up to 660 volts. The important sections of this specification follow:

Parkway Cable

(4) Cable. (a) The cable shall consist of ..... conductors insulated with rubber compound and laid into cable with paraffined jute laterals to make round. The assembly shall be taped and over the core thus formed a lead sheath shall be placed. Over the lead sheath shall be laid a layer of impregnated jute bedding, then two overlapping layers of steel tape. An outside layer of impregnated jute covering shall be laid over the tape.

(5) Conductors. (a) Number and size of conductors in cable shall be as follows:

Number of conductors	Circular mils or A.W.G. of conductors	Number of wires each conductor
.....	.....	.....
.....	.....	.....

(b) The conductors must be soft-drawn, annealed copper

wire, having a conductivity of not less than 98 per cent of that of the annealed copper standard. Each wire forming a conductor must be continuous without weld, splice or joint throughout its length, must be uniform in cross-section, free from flaws, scales and other imperfections and provided with a heavy uniform coating of tin.

(6) Taping and filling. (a) The core of the cable must be made cylindrical in form and properly laid up with one wire in each layer taped for a tracer. Cables of more than three and less than seven conductors shall be made up with a paraffined jute center. Each layer of core must have a helical lay, each consecutive layer being helically laid in reverse direction from the preceding one. All interstices between insulated conductors must be thoroughly filled with paraffined jute to make round, and the core then covered with a layer of rubber insulating tape overlapping for one-third its width.

(b) The tape shall be of closely woven cotton filled with rubber insulating compound and laid to make a smooth surface. The jute is to be well twisted, thoroughly paraffined and applied helically.

(7) Lead sheath. (a) A sheath of approximately 99 per cent pure lead shall be applied over the assembled and taped conductors, and be of the following thickness for each of the different sizes of cables:

Diameter of cable over taping	Thickness of lead sheath
Under 1 in.	3/32 in.
1 in. to 2 in.	⅛ in.
Over 2 in.	5/32 in.

(b) The minimum thickness shall not at any point be less than 90 per cent of that required.

(8) Armoring and covering. (a) The cable after being covered with lead shall be run through hot asphalt compound, after which the sheath shall be protected by one layer of impregnated soft jute roving spun on with a close short lay which shall not be less than 2/32 in. in thickness measured in finished cable.

The cable with impregnated jute covering shall be run through hot asphalt compound after which two layers of metal tape shall be laid over the jute. The two layers of tape are to be laid in the same direction and the outer shall be centered over the spaces between turns of the inner layer. The space between adjacent turns of tape shall not exceed one-tenth the width of the tape except for sizes less than 1 in. diameter; the space between adjacent turns of tape shall not exceed 1/10 in.

(c) After the tape is applied, the cable shall be run through hot asphalt compound. There shall then be laid over the tape one layer of impregnated three-ply, 14-lb. impregnated jute yarn with a close, short lay. This layer shall be applied in the reverse direction to the adjacent metal tape. The cable shall then be run through hot asphalt compound and finished by running through material to prevent sticking.

(9) Steel tape. (a) Steel tape shall be of mild steel, ungalvanized, having a tensile strength of not less than 50,000 or more than 70,000 lb. per sq. in. The width of the steel tape and its thickness for various sizes of cable core shall be as follows:

Cable diameter over jute bedding, in.	Maximum width steel tape, in.	Minimum thickness each tape, in.
Over 2.00	2	0.03
2.00	1¾	0.03
1.70	1½	0.03
1.40	1¼	0.03
1.00	1	0.03
0.75	¾	0.02
0.45 or less	½	0.02

(b) For intermediate diameters, the tape shall be of width and thickness of the next larger diameter.

(10) Workmanship. (a) General. 1. The insulation shall consist of a properly vulcanized rubber compound which shall be homogeneous in character, tough, elastic and applied concentrically about the conductor and shall fit tightly thereto. Where the insulation is applied in more than one layer, adjacent layers shall be vulcanized into a homogeneous mass.

(b) Repairs and joints. 1. Where repairs or joints are made in the insulation, the work shall be done in such manner that the repaired part or joint, and all parts affected in the process, shall be as strong and durable electrically and mechanically as the remainder of the insulation and shall not exceed the diameter limitations.

Action recommended: approval for letter ballot for inclusion in the Manual.

Specifications to be Made Obsolete

R.S.A. Specification 2512—Wood Cross-Arms.

R.S.A. Specification 2612—Cross-Arm Braces and Heel and Toe Bolts.

R.S.A. Specification 2712—Steel Cross-Arm Pins.

R.S.A. Specification 2812—Cross-Arm Through Bolts and Double Arm Bolts.

R.S.A. Specification 3012—Eastern White Cedar Poles.

The following reference sheet is submitted for inclusion in the Manual to supersede the above specifications:

Specification for Pole Line Hardware

The recommended practice of the American Railway Association, Telegraph and Telephone Section, adopted October, 1927, will be found in the Manual of the Telegraph and Telephone Section under the heading "1-A-20." The specification includes the following drawings:

HARDWARE OF GRADE "A" STEEL

T & T 1741—Rock Guy Anchor, Type 1.
T & T 1742—Rock Guy Anchor, Type 2.
T & T 1743—⅜-Inch Carriage Bolt.
T & T 1744—Cross-Arm Bolt.
T & T 1745—Double Arming Bolt.
T & T 1746—½-Inch Machine Bolt.
T & T 1747—Flat Cross-Arm Braces.
T & T 1748—Steel Angle Diagonal Cross-Arm Braces.
T & T 1749—Steel Angle Vertical Cross-Arm Braces.
T & T 1750—H Fixture Braces.
T & T 1751—Break Iron.
T & T 1752—Two-Bolt Guy Clamp.
T & T 1753—Three-Bolt Guy Clamp.
T & T 1754—One-Bolt Messegner Clamp.
T & T 1755—Three-Bolt Messenger Clamp.
T & T 1756—Guy Hook.
T & T 1757—Messenger Reinforcing Link.
T & T 1758—Break-Iron Pin.
T & T 1759—½-Inch Cross-Arm Steel Pin.
T & T 1760—⅝-Inch Cross-Arm Steel Pin.
T & T 1761—½-Inch by Six Foot Guy Rod.
T & T 1762—⅝-Inch by Seven Foot Guy Rod.
T & T 1763—¾-Inch by Eight Foot Guy Rod.
T & T 1764—⅞-Inch by Eight Foot Guy Rod.
T & T 1765—⅜-Inch Fetter Drive Screw.
T & T 1766—½-Inch Fetter Drive Screw.
T & T 1767—Pole Step.
T & T 1768—Reinforcing Strap.
T & T 1769—Safety Strap.
T & T 1770—Pothead Support.

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HARDWARE OF GRADE "B" STEEL

T & T 1771—Hub Guard.
T & T 1772—Guy Plate.
T & T 1773—Thimbles.
T & T 1774—Washers.

SPECIAL

T & T 1775—Thread Gage (see Drawings T & T 1758, 1759 and 1760).
T & T 1776—Cobs for Steel Pins (see Drawings T & T 1758, 1759 and 1760).

Adopted as recommended practice of the American Railway Association, Signal Section, at Chicago, Ill., March 5, 1929.

Action recommended: acceptance for submission to letter ballot superseding subject-matter in the Manual.

Discussion

[In the absence of Chairman G. H. Dryden (B. & O.) this report was presented by W. H. Elliott (N. Y. C.). Mr. Elliott took up first the specification covering mineral matter rubber-compound insulated signal wire, and then the specification covering parkway cable. J. E. Saunders (D. L. & W.) called attention to the duplication of effort in a number of paragraphs of these two specifications and pointed out the economy in printing the advance notice in the Manual if this duplication could be avoided. However, Secretary Balliet (N. Y. C.) did not believe that it would be possible, or even advisable, to combine the two specifications in the interest of simplification. Mr. Elliott also was of this opinion and stated that every specification in the Manual should be completed in itself in order to facilitate its use by manufacturers, contractors and railroads. A. H. Rudd (Penna.) suggested that the heading of the parkway cable specification be modified to make it clear that the specification referred only to parkway cable made up of conductors which are surrounded with mineral matter, rubber-compound insulation such as provided for in the insulated wire specifications. Mr. Elliott then moved the approval of the insulated wire and parkway cable specifications as revised, and *his motion was carried.* Following this, *he moved that five obsolete specifications be removed from the Manual and this motion was also carried.* Then he presented a specification for pole line hardware which covered 36 pole line specialties shown on drawings found in the Manual of the Telegraph and Telephone Section, A. R. A. *Mr. Elliott moved that these pole line specifications be approved, and his motion was carried.*]

Report on D-C. Block Signaling

Specifications for new relay includes requirement for efficient operation

E. N. Fox
Chairman

THIS committee submitted three revised specifications covering, respectively a d-c. neutral relay, concrete trunking and capping for the protection of insulated signal wires and cables, and a complete installation of d-c. automatic block signals. The committee also submitted a revision and consolidation of two previous specifications in the Manual, covering a d-c. motor-operated semaphore signal. In this specification, the committee included the usual requirements of all signal specifications relative to drawings, materials and workmanship, manufacturing inspection, warranty and shipment; but certain sections of this revised specification are given here in abstract, because they touch upon the most important features of the committee's work of revision. For instance, in respect to mechanism cases, the committee stipulated that:

(c) Mechanism cases shall be provided with openings for ventilation. Each opening shall be provided with a screen and protected by a hood. The opening shall be provided with a cover conveniently located for adjustment of ventilation.

(d) Each section of a base-of-mast mechanism case shall have four openings for ventilation, two in opposite sides of the case. Each opening shall have an area of not less than 10 sq. in. and be covered with a screen of No. 31 A.W.G. brass or copper wire, 40 wires per inch. The hood shall extend at least 1 in. below the lower edge of the opening into the mechanism case, and the area of the opening at the lower side of the hood shall be at least 60 per cent of the area of the opening into the case.

(e) Side clamp mechanism cases shall have two openings for ventilation, one near the top and one near the bottom. The openings shall have an area of not less than 1½ sq. in. Openings shall be covered with a screen of No. 31 A.W.G. brass or copper wire, 40 wires per inch.

In a list of general mechanism requirements, this specification included five detailed stipulations regarding the torque values and methods of making torque tests of semaphore signals. The sections pertaining to these requirements follow:

(f) Means shall be provided for attaching testing apparatus for making torque tests of the semaphore shaft in the field.

(g) The signal, with spectacle, roundels, blade and mechanism assembled, shall travel through the full arc (90 to zero deg.) in not more than 8 sec.

(h) The signal, with spectacle, roundels, blade and mechanism assembled, shall start toward its restrictive position from any point in its arc of travel with a counter-torque of 20½ ft.-lb. applied at the semaphore shaft.

(i) The torque applied at the semaphore shaft, with the spectacle removed, necessary to start that part of the mechanism connected thereto from any position in its arc of travel, shall not exceed maximum mechanism friction shown on Drawing 1064.

(j) The additional torque required to overcome the increased friction of the semaphore shaft, due to weight of the spectacle and blade, shall not exceed 2 ft.-lb.

Twelve detailed requirements covering the electric driving motor were listed in the specification. Four of these paragraphs dealt with the torque values at the motor shaft:

(f) The motor shall start the semaphore from any point in its arc of travel with 60 ft.-lb. torque and rated voltage at the motor terminals.

(g) With a torque on the semaphore shaft, as shown by curve "A," Drawing 1064, and with normal rated voltage applied

at the motor terminals, the maximum energy required to move the semaphore arm from the zero deg. position to the 90 deg. position shall be not more than 300 watt-seconds.

(h) The motor shall start the semaphore with 45 ft.-lb. torque from any point in its arc of travel, when a voltage of 40 per cent under normal is impressed on the motor terminals.

(i) A motor and mechanism of the drive back type shall start toward the restrictive position when the voltage impressed on the motor terminals is reduced to 50 per cent of the minimum required to start it toward the proceed position when the semaphore torque is 45 ft.-lb.

The release values of the hold-clear device on a semaphore signal were clearly specified in the following paragraphs:

(a) With a torque on the semaphore shaft as shown by curve "A," Drawing 1064, the hold-clear device shall hold the mechanism in the 45 or 90-deg. position when a voltage of 40 per cent under normal is applied at its terminals.

(b) The hold clear device shall be so constructed that it will release and allow the mechanism to assume its restrictive position when 25 per cent of the rated voltage is impressed upon the terminals of quick-acting hold-clear windings, or when 18 per cent of the rated voltage is impressed upon the terminals of the slow-acting hold-clear windings, the semaphore torque in either case being as shown by curve "A," Drawing 1064.

(c) The hold-clear device of the magnet type shall have an air gap between armature and magnet cores, of not less than 0.015 in., maintained by positive and durable stops. The construction shall be such that there shall be no undue accumulation of lubricating oil, dirt or rust in the air gap. Magnet coils shall be so applied and connected that they can be replaced easily.

This specification was submitted for acceptance for approval by letter ballot.

Direct-Current Neutral Relay

The aim of the committee in this specification was to provide for a direct-current neutral relay for operation on low-voltage circuits. One of the important parts of any signal relay is the air gap between the armature and pole pieces. The specification required:

(a) A minimum working magnetic air gap of 0.015 in. shall be maintained by an adjustable hard-drawn phosphor bronze stop pin so placed that its position relative to the cores shall be fixed and so that when the armature is picked up it will strike against the stop near the edge farthest from the bearings and midway between the cores. The physical working air gap shall be not less than 0.013 in.

(b) A non-adjustable stop pin of phosphor bronze shall be placed under each core near the edge farthest from the bearing, protruding not less than 0.010 in. from the under side of the core or the upper side of the armature for safety purposes.

Allowable contact resistances and the method of determining resistance values of contacts were clearly stipulated in the following three paragraphs:

(e) For front contacts of the carbon-to-metal type, the resistance of the contacts shall not, in 100,000 operations (when operating 10 times per min.), average more than 0.3 ohm per contact when the relay is energized at "working current" and when not breaking current or when current broken by the contacts does not exceed 20 m. a. through a 500-ohm circuit having an inductance equivalent to that of a 500-ohm slow-acting slot coil, or when breaking a non-inductive tungsten lamp load of 3 amp. The contact resistance shall be determined by taking at least 20 readings on each contact of the relay at intervals of 5,000 operations during the test. The contact resistance shall be the average of all readings. The initial cleaned contact resistance shall not exceed 0.18 ohm per contact when the relay is energized at "working current." Each contact shall be designed to carry 3 amp. continuously and 5 amp. for 30 sec. without injurious heating.

(f) For front contacts of the carbon-to-carbon type, the resistance of the contacts shall not in 100,000 operations (when operating 10 times per min.) average more than 3 ohms per contact when the relay is energized at "working current" and when not breaking current or when current broken by the contact does not exceed 30 m. a. through a 3,500-ohm circuit having an inductance equivalent to that of a 3,500-ohm slow-acting slot coil. The initial cleaned contact resistance shall not exceed 0.4 ohm per contact when the relay is energized at "working current." Each contact shall be designed to carry 3 amp. continuously without injurious heating.

(g) For contacts of the metal-to-metal type, the initial cleaned contact resistance shall not exceed 0.03 ohm per contact. Each contact shall be designed to carry 3 amp. continuously and 5 amp. for 30 sec. without injurious heating.

(h) The contact fingers shall be made of such material and so proportioned that they will not flex appreciably under operating conditions.

(i) A device shall be provided to lock the armature rigid with all contacts open during shipment.

One of the most important sections of the specification was that relating to relay adjustments. The minimum drop-away and maximum pick-up current values were covered by the following requirements:

(a) Relays shall be so adjusted that when tested the operating current values shall be as follows:

	4-ohm	2-ohm
1. Minimum drop-away with contact pressure	0.037 amp.	0.053 amp.
2. Maximum pick-up and working current	0.070 amp.	0.105 amp.

(b) The minimum front contact opening shall be 0.050 in. and with the front contact just closing, the minimum back contact opening shall be 0.020 in.

(c) Tests shall be made on relays that are assembled ready for service as follows:

1. An initial current of four times the working current shall be applied to the coils and then reduced until the armature drops away. This value shall be termed the drop-away current with contact pressure.
2. The circuit shall then be broken and current again applied to the coils and increased until the armature is picked up. This value shall be termed the pick-up current.
3. The current shall then be increased until the armature is against the stop. This value shall be termed the working current.

This specification was submitted for acceptance for letter ballot.

Track Shunting by Rail Motor Cars

As a part of its report, the committee submitted as information, a progress report on track shunting by rail motor cars. An abstract of this follows:

Difficulty has been experienced on many railroads in obtaining reliable and adequate shunting of the track circuit by rail motor cars, the term "rail motor car" as used herein, referring to the passenger-carrying type of equipment, and not the small section crew type of motor car. As a result of the troubles experienced, Committee IV was instructed to investigate this subject and give it preferred handling. The committee presented a report of the data collected thus far, together with our analysis of same.

The failures in proper operation are of three types: slow shunting of relay, false pick-up of relay, and failure of relay to shunt. While these three types of failures are more cor-

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related, in actual operation, they each have certain distinctive features.

Slow shunting of relay.—Slow shunting of the relay means the delay time, or time of lag, between the application of the shunt across the rails and the dropping away of the armature of the relay. It may be an abnormal appreciable period of seconds, or it may be the normal drop-away period of 0.9 to 1.6 sec.

Improper operation due to slow shunting occurs usually on single track, and on multiple track signaled for traffic in either direction, or having double-direction highway crossing protection on each track. The circuits generally affected are the A. P. B. ones, and those employing interlocking relays, either track or line. While offhand it might seem peculiar that trouble would be experienced with a delay shunting in a perfectly normal manner, if it is borne in mind that a relay picks up much quicker than it shunts, it will be seen that with a single-unit motor car, running at high speed, passing over a pair of insulated track joints having a track relay on each side, the relay on the leaving track circuit will pick up before the relay on the entering track circuit shunts. This results in improper functioning of the directional or selector relays in an A. P. B. system, in a briefly displayed false-clear signal in a color-light system, and in automatic highway crossing protection operating with the train receding from the crossing as well as approaching it.

There are various methods of remedying this trouble, depending upon local circuit conditions. One method is to control the selector relay through a thermal relay, which requires a predetermined time, usually about 5 sec., to heat a coil sufficiently to close the relay contacts. In certain other cases a simple revision of the A. P. B. circuits will rectify matters. Similarly in the case of highway crossing protection, operation receding from the crossing can be prevented, where an interlocking track relay is used, by shunting the leaving ends of the interlocking relay through a back contact on the entering end. The committee intends to present some typical circuits at a later date.

False pick-up of relay.—False pick-up of relay occasionally occurs due to a light weight car running at high speed swaying or rocking on the track, thereby momentarily breaking the shunt circuit through the wheels and axle. It will also occur if a car enters a section of track which has been heavily sanded or rusted. On one road using alternating current track circuits, in numerous instances, the track relay would pick up when the car was part way through the track circuit and approaching the transformer end. As this road uses a normal danger system, it not only resulted in a potential false-clear signal in the rear, but it caused the clear signal in advance of the train to turn red in the engineman's face, thereby calling attention to this type of failure far more readily than usual. This condition has been rectified on this railroad by the placing of a 1-ohm impedance coil in series with the relay through a back contact, thereby increasing the pick-up value of the relay. When the relay picks up, this extra impedance is shunted out, leaving only the original 1-ohm impedance of the relay.

Relay shunt failure.—Undoubtedly the most serious condition existing and the one which is going to be the most difficult to remedy, is that which causes a failure to shunt. This failure to shunt may occur the entire length of a track circuit, or it may only last until the train is partially through the circuit.

The committee, through personal interviews or correspondence, has endeavored to obtain information from 43 railroads. Twelve of these roads were found to have no motor cars operating in track circuit territory. Of the remaining 31, 14 report having had shunt failures, 3 having had trouble from slow releasing, and 14 report no trouble. Almost all of the 14 reporting no trouble, however, had conducted no tests and did not exactly know whether or not they were operating these cars under any margin of safety, or whether at times they were on the ragged edge of a false-clear failure. Many of the other roads reported the failures to be infrequent.

Conditions Affecting Rail Shunt

Four conditions of the rail or rail surface have been found to vitally affect the train shunt values: a ferro-ferric oxide enamel, a silicon enamel, a cinder enamel and a rust coating.

The ferro-ferric oxide enamel is found to be more prevalent where traffic is the heaviest, and furnishes the explanation as to why a bright, shiny rail is often the most difficult to shunt. It is formed by the constant pounding and hammering of the rail surface by heavily loaded wheels, resulting in a cold forging of the top of the rail, which flattens and elongates the cementite constituent of the steel. Eventually this forms a top skin surface on the rail a few thousandths of an inch thick, extremely hard, tough, and almost impossible to penetrate. Unfortunately, it also possesses certain insulating qualities, the thickness and insulating properties apparently being proportional to the density of traffic.

It was this type of enamel coating that caused so much difficulty during the development of the Sperry transverse fissure car. At first, this car was designed so that a low-voltage high amperage current was conducted to the rail through one set of brushes and away from the rail through a second set of brushes located a few feet behind the forward brushes. This method worked satisfactorily during tests on side tracks, but when the car was tested on mainline rails, so much trouble resulted from this enamel insulation that the inventors were forced to redesign the apparatus, after months of experimental work in trying to break through this coating with acids, grinding, etc., and adopt a parallel conductor induction method.

The cause of the Sperry car development troubles has been corroborated by information received by this committee. At least two railroads have reported shunting failures on mainline tracks having heavy coal traffic. One road reported these failures occurred entirely on an eastbound track carrying loaded coal trains, with no failures on the parallel westbound track carrying the returning empty cars. The solution of this condition bids fair to be a difficult problem, particularly as from the viewpoint of track and roadway men, this tough skin effect is a very desirable condition.

Silicon enamel is formed by the continual use of sand in certain localities, resulting in its being ground into the surface of the rail. A similar but worse condition exists from too free use of sand by the motor car itself. In either case, partial or entire insulation of the car from the rails is obtained. Some railroads prohibit the use of sand by motor cars, except in extreme cases, while certain other roads locate the sand pipe behind the first pair of wheels. Cinder enamel occurs usually in tunnels, and frequently the insulation properties are increased by a paste coating on the rails of oil, grease and dirt.

A great many failures are due to rust coating the rails, particularly on line of light traffic, and where no trains are run during the night or on Sunday. Some roads attempt to take care of this by limiting the speed of the motor cars over highway crossings having automatic protection to 10 m.p.h., or to make the first train in the morning stop and flag over the crossing. In automatic signal territory some roads insist on the use of manual block protection, particularly for light weight cars. On one road having considerable difficulty from rust caused by salt brine dripping from refrigerator cars, the motor car is equipped with wire brushes forced by heavy springs to ride on the rail surface. This method has been successful, but requires frequent renewal of brushes.

The part played by the track circuit itself is demonstrated by the fact that one road reports it has no trouble at all during wet seasons, but does have shunt failures after long droughts. Another road has improved its shunting by cutting a resistance unit in series with the track relay at the relay end. Some roads have improved conditions by changing to alternating-current track circuits. Another road reports good results from the use of an alternating-current track circuit with a direct-current track relay, the current being rectified at the relay. Unquestionably the installation of shorter track circuits will prove to be a benefit.

Discussion

[The report was presented by Chairman E. N. Fox (B. & M.), and the motion that *the proposed Specifications for Direct Current Motor Semaphore be submitted to letter ballot was carried.* The specification for Tractive Armature Direct Current Neutral Relay was next considered.]

E. T. Ambach (B. & O.): It occurred to me that (C) refers to one type of wire, and while it says "wire with equally good insulation," that might cover enameled wire; the next section refers to impregnation, which would practically exclude enamel wire unless the enamel wire were covered with some silk or cotton. We do not wish to exclude enamel wire.

Chairman Fox: That is covered by the phrase "or otherwise treated." "These coils shall be impregnated or otherwise treated so as to satisfactorily protect." Therefore, impregnation is not insisted upon.

C. R. Beall (U. S. & S. Co.): We have been impregnating enameled wires for several years, and using the vacuum treatment; that is, the coils were heated up thoroughly and vacuum applied to extract the moisture; then the gum was applied and forced into the coils by pressure, and they were heat-treated after that.

Chairman Fox: In Paragraph 7, Contacts, under 7

(e) the committee desires to reword the sentence now reading: "The contact resistance shall be the average of all readings," to read as follows: "The average of all readings shall be considered the contact resistance."

Mr. Ambach: May I go back again to coils. Under (g) it says: "The coil terminal wires from the ends of the coils closest to the cores shall be used as track leads." I presume that has reference to the relay used as track relay. Of course, the specification covers both track and line.

Chairman Fox: That is primarily for lightning protection. In case lightning comes onto the coil wire, it jumps to the coil without burning through the entire coil. I believe that is advantageous both for the track relay or line relay.

Mr. Ambach: No doubt it is, but what I wanted to bring out is the fact that these relays, for which this specification is prepared, covers both line and track, and in this particular sentence you only refer to track.

Chairman Fox: We can change that wording so as to cover that objection.

[The motion to *adopt the Specification to supersede those now in the manual was carried,* and the same action was taken with respect to the Specifications for Concrete Trunking and Capping.]

Mr. Fox: Revision of A. R. A. Signal Section Specification 6324, A. R. A. Signal Section Specification 6329, Direct Current Automatic Block Signals—First and Second Voltage Drainage, has not been before the section up to now. However, it is revision of a 1924 specification. It was found necessary to make only a few changes, aside from putting it in the present standard form.

Mr. Ambach: Fifteen (a)—Gasoline Engine with Fuel and Water Tank, Specification 1211. I think that was taken out of the Manual.

Chairman Fox: Then we will remove it from here.

Mr. Ambach: The committee has specifications on wiring, which if acceptable to the section will cover 32, 33, 35, 36, 37 and 38 in the specification on D-C. Signals. I was wondering whether or not we might have referred to that specification and saved printing.

W. M. Post (Penna.): Those paragraphs should be the same in both specifications.

[*The motion to omit section 37 was carried, and it was then moved that the report be adopted.*]

Chairman Stoltz: Do you care to have that as revised?

H. S. Balliet (N. Y. C.): Before you state the motion, I wish to state that the "A. R. A. Requisites" are correct.

Mr. Ambach: Number 42 will be changed. Specification 9820 is under revision now.

W. M. Post (Penna.): Committee IX is making recommendation to remove some specifications that are referred to under Line Material and Line Construction. It has to be checked.

Chairman Fox: If Committee IX will advise us what changes it is making, we shall be glad to work in accord with it. We have no information, of course, of that nature.

J. C. Mock (M. C.): Under 46, Trunking, there are three lines. My attention has been called recently to material that has been used on railroad crossings. Was that intended?

Chairman Fox: The use of three lines is the general practice, and should be the standard procedure.

Mr. Mock: That seems to be worth looking into.

[*The specification on "Annunciator Bells" was voted to "letter ballot for removal from the Manual."* In reading the "Progress Report on Track Shunting by Rail Motor Cars, Mr. Fox made the following interpolations:]

Chairman Fox: The committee had some thought of there being some possibility of doing away with this surface coating, through the metallurgy of the steel. top surface coating, through the metallurgy of the steel. J. V. Neubert, of the New York Central, states that this tough skin is desirable, and opposes any efforts to do away with it.

J. A. Peabody (C. & N. W.): Some years ago we had a track that was used only by locomotives running at very low speeds, never using the brakes. The surface of this was apparently developed so much so that we had to give up the signals in that particular piece of territory.

J. E. Saunders (D. L. & W.): Did the committee in its investigation ascertain whether sand was used on these lighter cars; on all of them or a few of them?

Chairman Fox: I think on roads where they have been having trouble of this nature they are trying to eliminate the use of sand.

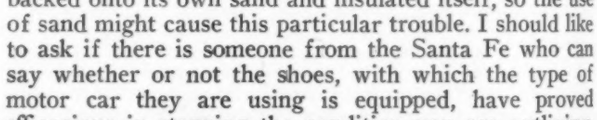
Mr. Saunders: I wonder if we cannot make a definite recommendation from this body that sand not be used on light cars.

F. W. Pfleging (U. P.): The trouble I have had is when a freight train preceded the motor car and left the sand on the rail and the motor car followed the freight train over that section of track. Another trouble is the weed killer, and while you would think the compound would give a good shunting on the rail, about a half hour later it gives a rusticator which is a very high resistance.

Mr. Saunders: I had in mind the case I heard of where a pusher locomotive used sand after uncoupling, backed onto its own sand and insulated itself, so the use of sand might cause this particular trouble. I should like to ask if there is someone from the Santa Fe who can say whether or not the shoes, with which the type of motor car they are using is equipped, have proved efficacious in stopping the condition you are outlining. One of those cars is shown at the Coliseum. I noted they had shoes provided for pressing hard on the rail.

E. Winans (A. T. & S. F.): As a superintendent of small motor inspection cars, we have found that our greatest trouble was not with the coating on the rail but the coating on the wheel itself, and we equipped all those wheels with heavy wise brushes, held up with spring pressure, which practically eliminated that trouble.

P. M. Gault (M. P.): Mr. Fox, have you anything further to say about the banding of the tires and the composition? It apparently makes quite a little difference how these cars are braked. On routes having a fast schedule, where the car is forced to run at high speed and then make a hard stop on heavy brakage, naturally the wheel trouble is much greater than where they drift along to a stop.



Photograph by Lollar's

Talladega Creek Bridge on the Southern

Report of Committee on Interlocking

Eight revised specifications presented with report on snow handling

E. T. Ambach
Chairman

THE revision of eight detailed specifications covering interlocking parts, the removal of three specifications from the Manual, and a report on methods of keeping interlocked switches free from snow and ice, comprised the report of the Committee on Interlocking. The revised specifications covered such diversified subjects as a drawbridge circuit controller for the connection of electrical circuits between the shore spans and bridge ends of drawbridges; a mechanical time-lock for application to the lever of an interlocking machine; an electric lever lock for a similar application to an interlocking machine; an electric switch lock for application to a manually-operated track switch; the installation of wires and cables at interlocking plants, classification yards, automatic block signals, automatic train control systems and highway crossing signals; an electrically-operated switch mechanism for operating and locking switches, derails and movable frogs; and a time release for the control of signal and interlocking circuits. All of these revised specifications were presented for approval for submission to letter ballot.

Certain accessories used in the signal field are also employed extensively in other industries so that satisfactory devices may be secured in the open market without adhering to requirements included in specifications prepared years ago. The committee therefore recommended that these specifications be removed from the Manual because they were no longer being used. Included in this list were, R. S. A. Spec. 3913, Push Buttons; R. S. A. Spec. 4013, Floor Push; and R. S. A. Spec. 1211, Gas Engine with Fuel and Water Tanks.

That part of the report dealing with the problem of keeping interlocked switches free from snow and ice, which was presented as information, contained descriptions of snow handling systems, ranging from oil burners and kerosene pressure torches to steam heaters, combination steam and snow blowing apparatus, gas heaters, and electric snow melters. A suggested form of organization for handling snow, formed a part of this report.

Of the eight specifications presented, that one dealing with a switch operating and locking mechanism is reproduced here, in part, because of the present extensive use of such machines for interlocking, dispatchers control systems, etc. The specification covers a motor-driven mechanism for operating and locking switches, derails and movable frogs. Selected sections of technical importance follow:

Motor-Driven Operating and Locking Mechanism for Track Switch

(6) Operating requirements: (a) Mechanism shall perform its operation in the following sequence:

1. Operate detector bar one-half stroke (when used), unlock switch.
2. Operate switch.
3. Lock switch (when used), operate detector bar one-half stroke.
4. Indicate.

(b) The mechanism shall be so constructed that it can be stopped, reversed or obstructed at any point of its movement without damage.

(c) The mechanism shall be so constructed that it will follow the movement of the controller at the point of control.

(d) The mechanism shall be so constructed that the switch points are moved to the full normal or reversed position and are locked before the indication for the respective positions can take place.

(e) The circuit controlling device shall be so constructed that, for proper operation, it will be dependent upon the movement of the lock rod.

(f) The switch circuit controller, for proper operation, shall be dependent upon the movement of the switch point.

(g) The Normal operating voltage for first range mechanism shall be 20; the time of operation with this voltage at the motor terminals with an operating thrust corresponding to the curve shown on Drawing 1457, shall not exceed 30 sec. nor shall it exceed 40 sec. at a voltage of 20 per cent below normal.

(h) The normal operating voltage for the second range mechanism shall be 110; the time of operation with this voltage at the motor terminals with an operating thrust corresponding to curve shown on Drawing 1457, shall not exceed 4 sec. nor shall it exceed 5 sec. at a voltage of 10 per cent below normal.

(i) The mechanism in the locked position shall be capable of withstanding stress equivalent to a thrust of 20,000 lb. either on the switch operating or locking connection.

(j) The motor shall be capable of delivering, without injury, the thrust corresponding to the overload curve shown on Drawing 1457.

(7) Design. (a) Mechanism.

1. The mechanism and circuit controlling devices shall be enclosed in a substantial metallic weatherproof case, designed for mounting on two tie supports, the covering of which case shall be removable and equipped with suitable fastenings for application of the purchaser's padlock, and when open shall provide access to all parts. Means for readily draining oil and water accumulations shall be provided.

2. The mechanism and case shall be so arranged that the lock rod may be removed readily. The ends of plunger or locking dogs and holes or notches in lock rod shall have square edges. Such holes or notches shall not be more than 1/8 in. larger than the plunger, measured on a line parallel to the travel of the lock rod.

3. The mechanism case shall be provided with one wire entrance of ample size, conveniently located for access to binding posts, equipped with adapter castings and flexible metallic connections, and arranged to protect wires from mechanical injury.

4. The mechanism shall be designed to prevent movement due to vibration or external force applied to the connections.

5. The mechanism shall be designed to permit operation by use of a hand crank. A crank shall be furnished as a part of such mechanism.

6. An opening through which the crank is to be applied for hand operation shall be provided with a metallic weatherproof cover attached on the outside of the mechanism case, and equipped with suitable fastenings for application of the purchaser's standard padlock.

7. The mechanism and case shall be so designed that they will be applicable for right or left-hand operation and be interchangeable in the field.

8. The mechanism and case shall be so designed that the centering of the lock and operating connections and the location and kind of fastening to switch ties shall conform to switch layout drawings. The mechanism operating rod shall have 6 in. stroke.

9. The mechanism shall be designed for operation of a detector bar, Drawing 1098, and so arranged that, when the detector bar is not used, the operating connection may be removed. Operating connection to be furnished with mechanism.

10. The mechanism case shall be so designed that all unused openings may be securely closed.

11. The circuit controlling devices shall be housed in a separate compartment of the mechanism case, which compartment shall, so far as possible, be non-sweating and dirt-proof and have a separate metallic cover.

12. Contact space for four independent circuits shall be provided in addition to those necessary for control of the mechanism; the contacts shall be so designed that they will be positive in action, and each shall be adjusted to open or close as follows:

13. The contact springs shall be made of non-corrosive material of sufficient mechanical strength and current-carrying capacity to operate satisfactorily in connection with the circuits used.

14. The movement of the contact members shall be such as will insure a wiping contact.

15. The switch circuit controller shall be housed in the mechanism case.

(b) Motor.

1. The motor shall be enclosed in a substantial metallic weatherproof case, the cover of which shall be equipped with suitable fastenings for application of the purchaser's padlock, and when open shall provide access to the terminals, commutator and brushes, or their equivalent.

2. The motor shall be attached to, and form a part of, the mechanism, and be removable therefrom.

3. The wire entrance shall be of ample size, conveniently located for access to binding posts, and arranged to protect the wires from mechanical injury.

4. The motor shall be designed for:

(a) .....voltage range d.c.

(b) .....voltage range.....cycle a.c.

(c) Bearings.

1. The bearings shall be of ample dimensions to insure reasonable durability.

2. Provision shall be made for proper lubrication of the mechanism.

3. The motor bearings shall be so designed as to prevent oil from them getting on the brushes, commutator or windings.

4. Exposed oil holes shall be provided with weatherproof oil cups or covers.

(d) Clearance.

1. The mechanism case and motor assembly, when installed, shall extend not more than 6¼ in. above the base of rail, and at points of support not more than 4¼ in. below base of rail.

(8) Wiring. (a) Internal wiring shall be neatly arranged and placed in ducts or channels of ample capacity forming an integral part of the apparatus.

(b) Wire for internal wiring shall be insulated and of strands of tinned copper not larger than No. 27 A.W.G. wire. The aggegate cross-section of the strands shall be not less than No. 14 A.W.G. wire. An eyelet shall be provided at each end.

(c) Wiring or connecting diagram shall be conspicuously located in the mechanism case.

(9) Binding Posts. (a) Binding posts for external wire shall be located immediately adjacent to wire inlet and duct spaces provided to accommodate the conductors.

(b) The binding posts shall be in accordance with Drawing 1070. They shall be so constructed and arranged that they cannot be turned in the base or frame to which they are applied.

(c) The binding post supports shall be of such material that wire connections will not loosen due to shrinkage.

(10) Dielectric requirements. (a) Electrical apparatus assembled shall withstand for one minute an insulation test, at place of manufacture, of 3,000 volts a.c. between all parts of electric circuits and other metallic parts insulated therefrom.

(b) A surface leakage distance of not less than ¼ in. shall be provided between any exposed metallic part of the apparatus carrying current and any other metallic part thereof.

(c) Separate windings, which are insulated from each other, shall withstand for one minute an insulation test of 3,000 volts a.c. between their terminals.

(d) A potential of twice the normal operating requirements at a suitable frequency shall be impressed across the windings without any excessive flow of current indicating a short circuit.

(11) Insulation. (a) The coils and windings shall be of cotton-covered wire impregnated. Materials used for impregnation shall be in accordance with "Requisites for Impregnating Treatment of Non-Oil-Proof Electrical Windings."

(b) The material used for insulation shall be such as will not be injuriously affected by atmospheric conditions.

Discussion

[The report of the Commitee on Interlocking was presented by Chairman E. T. Ambach (B. & O.).]

E. N. Fox (B. & M.): Why is No. 6 (O) in Specification for Drawbridge Circuit Controller necessary? The Manual already specifies the second voltage range.

Chairman Ambach: In Requisite 6-0 it is provided that the first voltage range shall be blank in case they wanted some other voltage than 10 and 110.

Mr. Fox: You cannot change the Manual on that. I think that requisite should be taken out.

Secretary Balliet: "First range 30 and last; second, 30 to and including 175; third, over 175 and including 250; fourth, 250 to and including 650; fifth, 650, plus."

Chairman Stoltz: Will the committee go along with Mr. Fox's suggestion to eliminate that sub-paragraph?

Chairman Ambach: The question of No. 6, Design, will be taken up by the Board of Direction.

[A motion to *accept the Specification on Drawbridge Circuit Controller was carried.*]

Chairman Ambach: The committee discussed this at length, and decided that while the two specifications were similar in a great many respects, the electric switch lock and electric lever lock were two different applications. For that reason we voted to have two separate specifications.

Mr. Fox: It seems foolish to have all this duplication. The Manual is getting bulky. In fact, we have been told to take specifications out to make it thinner. It seems foolish to put in two specifications that are identically the same except for two paragraphs.

Personnel of the Committee on Interlocking

E. T. Ambach, asst. sig. engr., B. & O., Cincinnati, Ohio. *Chairman.*

F. J. Ackerman, sig. engr., K. C. T., Kansas City, Mo.
T. A. Allan, chf. sig. inspr., C. N., Toronto, Ont.
R. B. Amsden, asst. engr. sig., I. C., Chicago.
D. W. Fuller, asst. sig. engr., A. T. & S. F., Topeka, Kan.
W. N. Hartman, asst. sig. engr., C. & O., Richmond, Va.
W. Hiles, chf. sig. inspr., C. C. C. & St. L., Cincinnati, Ohio.
C. J. Kelloway, supt. sig., A. C. L., Wilmington, N. C.
H. F. Lomas, asst. sig. engr., I. C., Chicago.
W. B. Morrison, gen. mech. inspr., D. L. & W., Hoboken, N. J.
J. H. Oppelt, supvr. sig., N. Y. C. & St. L., Cleveland, Ohio.
B. F. Oler, inspr. sigs., Pennsylvania, Philadelphia, Pa. *Vice-chairman*
W. C. Sibila, spc. staff engr., N. Y. C., Cleveland, Ohio. *Vice-chairman*
T. C. Seifert, office eng., asst. sig. engr., C. B. & Q., Chicago.
C. Smith, sig. inspr., St. L.-S. F., Springfield, Mo.
W. N. Spangler, asst. supt. tel. & sig., Penna., Philadelphia, Pa.
M. Sutherland, sig. engr., M. C., Brunswick, Me.
R. W. Taylor, second asst. sig. engr., B. & O., Baltimore, Md.
O. R. Unger, asst. engr., M. P., St. Louis, Mo.
G. A. Ziehike, sig. supvr., U. P., Omaha, Neb.

[The motion that the section on Electric Switch Lock be accepted for submission to letter ballot to supersede subject matter in the Manual *was carried.* Mr. Amback then read the section on Wiring.]

Secretary Balliet: Mr. Chairman, I think from what we got in the committee's direction in the question of drawings and pole line construction, it would be wise, before we finally pass this to the Editing Committee for issuance, that it be forwarded to Committee IX on adjustment.

Chairman Ambach: There is a variance in the two. I think 13 (b), 1, 2, 3 and 4 might be revised to comply with the T & T specification, or we could leave the entire section out and refer to "details of line construction shall conform to T & T specifications ——— ———."

Chairman Amach: *I move the acceptance of the specification on Wiring for submission to letter ballot superseding subject-matter in the Manual.*

[*The motion was carried.*]

Chairman Ambach: We had a criticism on section 4 of the specification *"Indicate,"* to the effect that the mechanism does not in all cases indicate, but the position of the switch point is indicated, and for that reason it was suggested that the indication be optional. It might be well to put the word "optional" in brackets after the word "indicate," which the committee recommends. In 6 (e) should be revised so as to include such mechanisms as are used for centralized traffic control to read as follows: "Circuit controlling device shall be so constructed that, for proper operation, it will be dependent upon the movement of the lock rod or locking mechanism." That takes care of those mechanisms which have no lock rod.

We have a criticism on "G" that in view of the present state of the matter, the time limit should be changed. The committee considered that but could not agree in view of the operating curve which would have to be changed.

L. L. Beall (U. S. & S. Co.): If you increase the speed of operation, you take up more curve; there is no other way out. There is no use in going to the expense of providing facilities for 20 amp. if three or four will take care of it, and if you are not in a hurry to get the switch over. I do not believe any of you would care to put in enough caustic soda battery to operate the switch in, say, 10 sec. Movements can be built without any question to operate in 30 sec. or 10, 16 or 5 sec. It all depends upon how much power you want to put into them. Then, if you operate in, say, 5 sec. or in 10 sec., make a heavy load on a d.-c. relay. Of course, if the high speed operations are of paramount importance, then the battery and supply apparatus must be supplied.

[*A motion to accept the specification was carried.*]

Chairman Ambach: The title of the Operating and Overload Curve Chart Electric Motor Switch Operating & Locking Mechanism—Specification 10129, was changed to tie in with the specification and is referred to in the specification. *I move it be accepted for submission to letter ballot.*

[*The motion was carried.*]

Chairman Ambach: The committee originally had this to read: The purpose of the specification is to provide time release for the control of signal and interlocking circuits. We did not state on what voltage or what range, but we received a letter to the effect that we should add the first and second range voltage. I am perfectly willing to leave out that voltage range entirely, and then it can be used on any voltage range.

Chairman Stoltz: It is your privilege to withdraw.

Mr. Ambach: I withdraw that, and *move that this recommendation be subjected to letter ballot with changes.*

[*The motion was carried.*]

[A motion was *made and carried* to remove R. S. A. Specification 4013 from the Manual. A motion was also *made and carried* to remove R. S. A. Specification 1211 from the Manual.]

N.R.A.A. Holds Annual Meeting

"THE demand for display space at the exhibit of the National Railway Appliances Association, now in progress at the Coliseum, is greater than the supply," said Secretary C. W. Kelly, in the report which he made at the annual meeting of the association yesterday morning. There is a waiting list of 19 firms who are participating in the activities of the association as non-exhibiting members. In addition to these, about 40 companies that applied for space during the year were not assigned booths for various reasons, but the exhibit opened with all available display space in use.

Owing to the absence of President A. L. Greenabaum, the meeting was conducted by Vice-President S. P. McGough, western sales manager of the Lorain Steel Company, Chicago, who was subsequently nominated and elected president. The other officers elected are: Vice-President, W. H. Fenley, Kerite Insulated Wire & Cable Company, Chicago; secretary, C. W. Kelly; directors for three years, A. S. Anderson, Adams & Westlake Company, and M. C. Beymer, Oxweld Railroad Service Company, Chicago; director for one year, H. W. Renick, Magnetic Signal Company, Los Angeles, Cal. The report of the nominating committee was submitted by L. E. Weidman, of the Frog, Switch & Manufacturing Company, the other two members of the committee being W. H. Armstrong, Ingersoll-Rand Company, and Alex Chapman, Rail Joint Company.

On a motion by G. J. Slibeck of the Pettibone-Mulliken Company, the secretary was directed to supply each member company with a financial statement of the association's operations as soon as the books are closed. T. R. Wyles, Detroit Graphite Company, then offered a motion confirming all acts of the board of directors in conducting the affairs of the association since the last annual meeting and following the passing of this motion the meeting was adjourned.

President S. P. McGough

In selecting Mr. McGough as its president, the association gave recognition to a man who has been identified with its affairs ever since it held its first exhibit. He is representative of the veterans of the railway supply fraternity and is widely known not only by reason of his business connection, but through his affiliation with a number of clubs, including the Westmoreland Country Club.

While distinctly courteous and affable in his business and social contacts, he is not of the type that is given to taking the center of the stage. Rather, he is of that quiet, kindly mein that builds friendships slowly, but once formed those friendships are lasting. As one of his friends puts it, "He isn't up today and down tomorrow. He is a man to be depended on. If he makes a promise, you can forget it, because he will deliver when the time comes."

Mr. McGough was born at Franklin, Pa., on February 26, 1874, of American revolutionary stock, and after training as an engineer, entered the service of the Baltimore & Ohio as a rodman in 1894. In 1902, he became affiliated with the Lorain Steel Company, of which he became western sales manager in 1923.

Little Rollo and His Pop

Chapter I. Wherein the deliberations of the Signal Section are gone over in detail by our young hopeful

THE quiet halls of the Union Station were rudely disturbed yesterday morning. A long-legged gent with a perpetually harassed look, seven suitcases and one small boy, got off an incoming train. Hardly had they reached the waiting room, when the questions began:

This Is Little Rollo, and—

"Pop, where's the machine guns? Pop, show me a Chicago pineapple. Pop, is that man over there a racketeer? Pop, will I see Mr. Kelly at the Coliseum? Pop, will Mr. Rudd be at the signal meeting and tell more funny stories? Pop, may I go to the banquet again this year? Pop, will Mr. Lewis give me some more candy?"

Who was it? Need it be said that it was none other than young Rollo, the chief engineer's son, who attended the convention last year? That's who it was, and Rollo is much the same, except that an added shrillness in his voice gives a greater carrying power to his questions this year.

Breakfast momentarily silenced the young man, while his Pop stared moodily into his coffee, but the questions began immediately after the hot cakes had gone down.

As they walked into the meeting room Rollo piped up again:

"Why do they have railways, Pop?"

Pop, who, as may be remembered by the old-timers, was once a signal engineer considered a long time before replying. Finally, he said:

"I'll tell you, son, things have changed since my day as a signaller. Then we used to think that railways existed for the sole purpose of maintaining a first-class signal department, and, incidentally, of maintaining a bunch of signal engineers."

"Don't they think that any more, Pop?"

"No, Rollo. These boys actually co-operate. Every once in a while, on our railroad, one of them comes in and talks things over with me, and I've even seen them conferring with operating officials. They actually want to be of economic benefit to the American railways."

"Is that a better way, Pop?"

"If I were home," countered the old man, "I could show you some performance records that would make your eyes stick out, young fellow."

When the chairman announced adjournment for lunch, he had one eager supporter at least. Rollo was always eager to eat and he did himself justice at the table. He was all ears when the singing began and he joined in with gusto, if nothing else.

When the song was ended, he remarked:

"Say, Pop, did you notice that all those guys were off-key except me?"

"Rollo," answered his Pop, "could you do without singing? I would even prefer that you talk instead."

Rollo considered this soberly for a while, but only a short while. Then a chance remark reached his tender ears:

"Hey," he said, "what is I. C. C. order 13413?"

"That, my boy," replied Pop, "is what signal engineers use instead of coffee to keep them awake at night."

Just then, C. A. Christofferson rose to enter the discussion.

"Who is that, Pop," Rollo asked.

"That's the signal engineer of the Northern Pacific, he's quite a traveler."

"Where does he go, Pop?"

"Four years ago he went to Denmark for four months and last year he was there again and stayed one month."

"How come he only stayed one month last year, Pop?"

"Well, the Danish krone is worth four times as much to the dollar now as it was four years ago, my son."

Rollo was quiet for all of four seconds before he broke loose again.

"Pop," he yelled in his shrill voice, "what are derails in main tracks?"

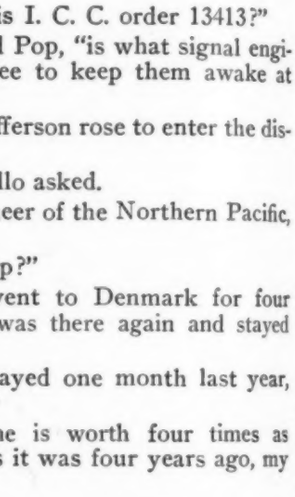
"Hush," said Pop, startled.

"But I want to know what derails in main tracks are, Pop," shrieked our young hero.

Pop hastily clapped his hand over Rollo's mouth.

"Shut up," he warned, "don't you know that mentioning derails in main tracks at the Signal Section is worse than mentioning King George in Mayor Thompson's presence."

"Gee, Pop, I'm sorry," said Rollo, as he bit his father's finger, "but what are they?"



—This Is His Worried Pop

"Young man," said Pop sternly, as he nursed the injured digit, "I'll tell you all about them in the privacy of the woodshed, when we get home."

Many New Devices at the Coliseum

More than 180 *exhibitors utilize* 70,000 *sq. ft. of floor space to display some* 700 *devices*

THE National Railway Appliances Association's exhibit at the Coliseum, which opened yesterday morning, includes the displays of 30 railway supply manufacturers whose devices were not shown in 1928 in addition to those of 159 manufacturers who participated in the display last year. In this year's exhibit are the devices of 189 manufacturers of materials used in the construction and maintenance of railway tracks, structures and signals.

For the last 10 years the arranging of exhibits at the Coliseum has become a matter of finding enough space for all of the manufacturers who wish to participate. As has been the case for the last four or five years, because of the insistent demand by each exhibitor for greater floor area, this year it was found necessary to refuse the applications of over 30 companies. Several manufacturers were even prevailed upon to withdraw their applications.

The space occupied by the exhibits in the main Coliseum hall and the north and south annex halls has grown from the 3,500 sq. ft. of floor area used in the parlors of the Auditorium hotel, 20 years ago, when the space available permitted only the display of models, plans and drawings, until now the devices cover a floor area of more than 70,000 sq. ft. In the first year that the Association moved from the Auditorium hotel to the Coliseum in 1908, it occupied a floor area of 30,000 sq. ft. More than 150 of the 700 devices on display are being shown for the first time and in practically every case they represent either an entirely new product or a product in which one or more new features are incorporated.

C. W. Kelly, secretary-treasurer of the National Railway Appliances Association, and his assistants, in deciding upon decorations for the interior of the Coliseum, have adopted a color scheme which is effective in displaying to the best advantage groups of products which are for maintenance reasons not painted in particularly bright colors. The ceiling of the main hall is made up of the primary colors, shading from one to the other, so that when viewed from either end of the room, it presents a rainbow effect. The sloping ceiling on each side of the rainbow band consists of a tan bunting ribbed at intervals with a green bunting. The sides of the hall, immediately above the exhibition booths are trimmed with brown bunting fringed with green. The same general scheme of decoration predominates in the two annex halls. Copenhagen blue and gold form the basis of the color scheme used in the decoration of panels separating the exhibits. Each panel carries the N. R. A. A. monogram and each post is surmounted by a gold ball, at the base of which are the N. R. A. A. initials.

A. L. Greenabaum
President

Mr. Greenabaum, who is vice-president of the O. F. Jordan Company, is unquestionably one of the best known and most popular members of the railway supply fraternity in the maintenance of way field. Like many other men engaged in the sale of railway equipment, he has enjoyed the advantage of a thorough training in railway construction and maintenance, having been employed for a number of years on the Rock Island where he was one of the first railway officers to occupy the position of supervisor of work equipment.

The restaurant, which in 1928 was moved from the basement of the Coliseum to the second floor over the South hall, has increased the floor area its dining room occupies, until this year it has a seating capacity of about 300. As in the exhibit halls the dining room has been decorated in Copenhagen blue and gold.

As in former years, the North hall serves as the main entrance to the Coliseum, with the South hall as the main exit. Telephones as well as telegraph service are available in the center of the Wabash avenue side of the building and registration of members is being carried on in the usual place at the temporary office of the secretary of the Association.

The Coliseum will be open from 8 a. m. to 6:30 p. m., except on Tuesday evening, which has been set aside by the American Railway Engineering Association to allow railway officers to attend the exhibit. On that evening the doors will remain open until 10 p. m. The exhibit will close after four days at 3 p. m. on Thursday.

The officers and members of the board of directors of the National Railway Applicances As-

sociation who completed a year of service with the election of a new group yesterday morning are: A. L. Greenebaum, vice-president, O. F. Jordan Company, East Chicago, Ind., president; S. P. McGough, Lorain Steel Company, Johnstown, Pa., vice-president; C. W. Kelly, Chicago, secretary-treasurer and director of exhibits; M. C. Beymer, Oxweld Railroad Service Company, Chicago; A. S. Anderson, Adams & Westlake Co., Chicago; J. W. Fogg, MacLean-Fogg Lock Nut Company, Chicago; W. H. Fenley, Kerite Insulated Wire & Cable Co., New York; W. H. McDermott, Wm. Wharton, Jr., & Co., Chicago, and J. T. McGarry, American Valve & Meter Co., Cincinnati, Ohio; directors: L. E. Weidman, Frog, Switch & Manufacturing Co., Carlisle, Pa., honorary director.

A list of exhibitors, with the devices exhibited for the first time shown in bold face type is given below.

List of Exhibitors

AC Spark Plug Co., Flint, Mich.—Spark plugs; oil filters; air cleaners. Represented by W. S. Isherwood and H. P. Schuyler. Space 168½.

Adams & Westlake Co., Chicago.—Highway crossing signals; semaphore lamps; switch lamps; classification lamps; marker lamps; lanterns; switch locks; **tonnage signals; locomotive lighting equipment; color light signals.** Represented by A. S. Anderson, E. Andrew, R. D. John, W. J. Pearson, W. G. Porter, H. G. Turney, G. L. Walters and R. D. Whitlock. Spaces 77, 78, 96 and 97.

Adams Motor & Manufacturing Co., Chicago.—Gasoline operated railway motor cars; **center load inspection car with free running air cooled motor.** Represented by W. E. Adams, R. S. Adams, W. A. Bailey and W. M. McClintock. Spaces 218 and 218½.

Air Reduction Sales Company, New York.—Oxygen and acetylene; welding and cutting apparatus and supplies; carbide; railroad lanterns; **portable carbide lights.** Represented by E. M. Sexton, B. N. Law, R. T. Peabody, H. L. Rogers, T. M. Hamer, C. A. Daley, J. W. Kenefic, J. S. Strate, M. M. Weist, R. C. Holcomb, F. E. Mull and G. Van Alstyne. Spaces 167, 167½ and 168.

Alemite Manufacturing Corporation, Chicago. — High pressure lubrication system for switch and signal equipment; **drive fittings for closing open oil holes.** Represented by C. A. Fine, John Karow, N. J. Kamen and Norman Matsen. Space 169.

American Brass Company, Waterbury, Conn.—Bronze and other welding rods; demonstration of oxy-acetylene welding; copper wire and cable. Represented by W. Harold Dowd, W. C. Swift, W. D. Martin, Jr., H. B. Wildman and D. S. Young. Spaces 293 and 294.

American Cable Company, Inc., New York.—Preformed wire rope; processed fittings; wire rope slings. Represented by G. C. Moon, C. D. Meals, W. H. Slingluff, L. Lockwood and G. A. Faerber. Space 102.

American Car and Foundry Company, Chicago.—Electric rivet heaters. Represented by A. G. Wood, F. C. Cheston and R. A. Williams. Space 255.

American Casting Company, Birmingham, Ala.—Culvert pipe; new design of 36 in. pipe. Represented by T. D. Crowley and L. G. Brown. Spaces 264 and 279.

American Chain Company, Bridgeport, Conn.—One-piece guard rails; car and engine replacers; compromise joints; rail benders; welding wires; right-of-way fencing; highway guard; preformed strand; bond wires; protection fencing; cables; fittings; cable slings. Represented by W. T. Kyle, A. H. Weston, E. J. Flood, J. J. O'Connell and W. H. Slingluff. Spaces 81 and 82.

American Fork & Hoe Co., Cleveland, Ohio.—Rail anchors; rail joint shims; ballast and tamping forks; schuffle hoes; stone hooks; stone, gravel and refuse rakes; hand ice and snow removal tools. Represented by W. E. Day, J. R. Dooling, A. F. Fifield, S. L. Henderson, E. Keough, J. G. Miller, J. J. Nolan, F. J. Reagan, F. C. Stowell and R. C. Violett. Spaces 235 and 236.

American Hoist & Derrick Company, St. Paul, Minn.—Locomotive ditcher; standard ditcher; locomotive cranes. Represented by Ward B. Maurer, Arthur Craine, D. L. O'Brien, Arthur Harvey and Miss H. M. Hoeller. Space 88½.

American Railways Hydrant & Valve Co., Staten Island, N. Y.—Water hydrants, cocks and valves. Represented by Wm. Volkhardt and A. N. Volkhardt. Space 160.

American Rolling Mill Company, Middletown, Ohio.—Ingot iron sheets and plates. Represented by E. M. Arndt, H. M. Arrick, A. W. Bryant and E. Harbeck. Space 157.

American Steel & Wire Co., Chicago.—Rail bonds; signal wires; welding wire; woven wire fence for right-of-way fencing; steel posts; wire fabric for concrete reinforcement; **dirt-set angle end and corner posts.** Represented by H. A. Squibbs, Frank Thomson, L. P. Shanahan, T. Hassell, C. A. Cochrane, H. S. Lockwood, A. W. Froude, C. S. Knight, Jr., C. F. Wiley, H. Barthell, Frank Conklin, John May, H. H. Febrey, E. E. Louis, W. H. Cordes, R. E. Francisco, R. A. Coates and H. V. Linneman, Jr. Spaces 265 and 278.

The American Valve and Meter Company, Cincinnati, Ohio.—Automatic water columns; universal telescopic spout; automatic float valve; stock drencher; switch stands; switch interlocker; water hammer eliminator; wheel flange and curve lubricator; rapid rail joint clamp. Represented by J. T. McGarry, J. W. McGarry, Dan. J. Higgins, Harry Z. Meginnis, John DePinal and Cecil W. Stevens. Spaces 130, 131, 132 and 133.

Ames Shovel & Tool Company, North Easton, Mass.—Track shovels; locomotive scoops; **handles for shovels and scoops.** Represented by H. S. Bywater and N. T. Jacobs. Space 122.

Anderson Manufacturing Company, Albert and J. M., Boston, Mass.—Plugs and receptacles for telephone and locomotive service, battery charging, arc welding and other industrial purposes; automatic time switches, both hand and electrically wound; knife and disconnecting switches for railway electrification service; insulators and fittings for trolley and third rail; testing and grounding clamps; **tagger for temporarily marking transmission and other lines needing repairs or changes.** Represented by Barry G. Durham and G. N. Miller. Space 194.

Andrix Lock Nut Company, Adrian, Mich.—Lock nuts; nut clamp. Represented by Harry Andrix, B. T. Andrix and J. C. Danes. Space 172.

Armco Culvert Manufacturers Association, Middletown, Ohio.—Paved invert pipe; perforated pipe; gates; catch-basins and connections. Represented by J. R. Wilks, E. T. Cross, T. Scott, W. J. Kelley, N. A. Powell, A. S. Rosing, W. R. Fraser and E. Edwards. Spaces 99 and 100.

Barber Asphalt Company, Philadelphia, Pa.—Asphalt products. Represented by George D. Fowle, W. F. Hartzell and H. J. Wells. Space 189.

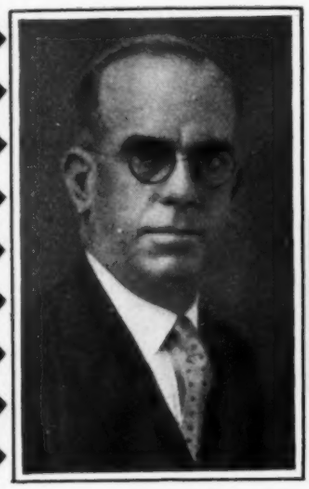
Barrett Company, New York.—Roofing materials. Represented by Walter Buehler, F. S. Nichols and J. F. Haynes. Space 189.

Bethlehem Steel Company, Bethlehem, Pa.—Switch stands; flangeway guard; hook flange guard rail; gage rods; rail anchor; mtal tie; track bolts and spikes; unit lock nut; switch stand. Represented by N. E. Salsich, R. L. Gillispie, J. F. Hennessy, J. L. Tygart, R. P. Deghuee, A. H. Koch, M. A. Vickers, C. Riddle, E. B. C. Goyne, O. W. Johnson, C. H. Cecil, R. Knibloe, F. M. Huffman, A. W. Stoever, W. W. Philler, J. V. Honeycutt, H. W. Prindle, C. L. Moses, C. R. Vincent and C. A. Alden. Spaces 70½, 71, 71½ and 72.

Binke Manufacturing Company, Chicago.—Portable painting equipment for maintenance work; two-gun portable compressor unit on three wheel truck; motor car unit equipped with compressor. Represented by V. G. Green and Robert Thompson. Spaces 152 and 153.

Brach Manufacturing Corporation, L. S., Newark, N. J.—Lightning protection apparatus, accessories, supplies and instruments; railway electric lamps and their accessories; pole line equipment; electrical specialties; **hydro grounds; cable hangers; lamp adapters; cast iron train order lamps; signal indicator; gate lamp; power off relay; power amplifier.** Represented by L. S. Brach, Godfrey Gort, Frank Faeth, A. R. Whitehorn and George Schoester. Spaces 182 and 183.

Buda Company, Harvey, Ill.—Division inspection motor car No. 619-GL; friction driven gasoline railway section motor car; friction driven light inspection motor car; motor car trailer; high speed self lowering ball bearing jack; journal jack; improved standard speed ball bearing screw jack; ratchet lifting jack; drill; car replacer; electric railway crossing gate with air generator; pressed steel wheel; tool grinder; track drill; bonding drill; cork track liner; track gage; track level; **clamp type bumping post; jack type rail bender for T rail; spike puller.** Represented by H. M. Sloan, R. B. Fisher, J. L. Artmaier, F. L. Gormley, J. J. Gard, E. H. Walker, R. M. Blackburn, A. J. Walsh, A. L. Briss, H. C. Beebe, L. O. Stratton, G. W. Hoover, E. I. Conant, A. H. Deimel, G. A. Secor and J. H. Weare. Spaces 44, 45, 46, 47, 63, 64, 65 and 66.

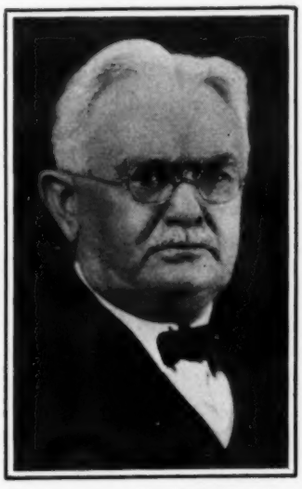


M. C. Beymer

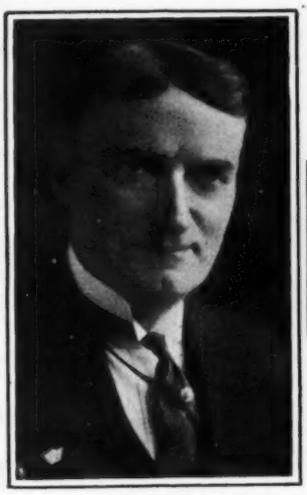
W. H. Fenley

J. T. McGarry

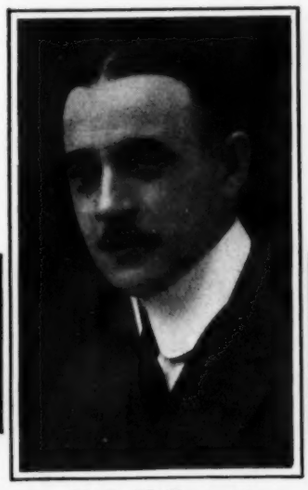
S. P. McGough
Vice-President



L. E. Weidman



J. W. Fogg



H. F. McDermott
In the center—
C. W. Kelly
Secretary

A. S. Anderson

Officers of the National Railway Appliances Association

Carey Company, Philip, Cincinnati, Ohio.—Crossing pavement; asphalt plank; waterproofing protection plank; rail filler; improved design of crossing pavement. Represented by C. V. R. Fullenwider and Eugene Keller, Jr. Space 166¾.

Carnegie Steel Company, Pittsburgh, Pa.—Light weight wrought steel wheels; steel cross ties; beam sections; **steel sheet piling.** Represented by L. C. Lustenberger, A. C. Jack, J. F. Miller, R. L. Twitchell and G. R. Schreiner. Spaces 268 and 275.

Carter Bloxonend Flooring Company, Kansas City, Mo.—Standard 8-ft. lengths of flooring. Represented by C. J. Carter, A. E. Giese and John Thomasma. Space 4.

Celotex Company, Chicago.—Building insulation; **insulation used under asphalt plank.** Represented by J. H. Bracken, D. J. Carmouche, E. E. Kelly, H. A. Winandy and T. B. Bracken. Space 184.

Chicago Bridge & Iron Works, Chicago.—Model of conical bottom steel tank, lighted picture case showing steel tank installations, heating arrangements for tanks in cold climates and settling basin arrangement in bottom of riser pipe. Represented by L. McDonald, E. P. Shelton, H. C. Brown, G. S. Sangdahl and M. E. Smith. Space 85.

Chicago Pneumatic Tool Company, New York.—Model portable compressor with pneumatic tie tamper, spike driver, rail drill, wrench, bonding drill, grinders, woodborers; electric track drill and portable electric drills. Represented by A. E. Goodhue, J. L. Rowe, E. K. Lynch, D. E. Cooke, S. A. Congdon, Jr., H. R. Deubel, L. F. Duffy, R. W. Nolan and F. J. Jobst. Spaces 202, 203, 212 and 213.

Chicago Railway Signal & Supply Company, Chicago.—Color-light block signals; flashing railroad crossing signals; neutral and polarized relays; interlocking relays; flashing relays; sheet steel instrument cases; color-light block signals equipped with adjustable focusing brackets and focus finders. Represented by C. R. Ahrens, B. V. Anderson, A. C. Dunne, D. J. McCarthy, W. M. McClintock, Clarence Rath, C. N. Suhr, and A. L. Warner. Spaces 108½ and 109.

Chipman Chemical Engineering Company, Inc., Bound Brook, N. J.—Chemical weed killers and spray equipment; **non-poisonous calcium chlorate weed killer in dry form.** Represented by R. N. Chipman, W. H. Moyer, D. Smyth, J. Darby, W. W. Dines and J. T. Sandberg. Spaces 50½ and 51.

Cleveland Frog & Crossing Company, Cleveland, Ohio.—Reception booth. Represented by G. C. Lucas, L. G. Parker, G. A. Peabody, J. A. Donahey and H. I. Prentice. Space 90.

Cleveland Pneumatic Tool Company, Cleveland, Ohio.—Railway appliance tools; **rail drilling machine; and track frame; back fill tamper; Y-hose fittings for use with tie tampers.** Represented by H. S. Covey, C. J. Albert, H. C. Newton, R. E. Ahern and Arthur Scott. Space 204.

Cleveland Railway Supply Co., Chicago.—Safety foot guard and heel block; guard rail; closed trough flangeway guard; **open trough flangeway guard; reversible foot guard; wood working machine.** Represented by F. A. Peck, W. H. Nelson and H. P. Blum. Spaces 108½ and 109.

Conical Roller Cattle Guards Corporation, Anniston, Ala.—**Railway cattle guard.** Represented by A. Dishman and F. M. Ewing. Space 192½.

Copperweld Steel Company, Glassport, Pa.—Ground rods; wire; strand. Represented by E. G. Elg, W. W. Martin, Jr., W. W. Ege, C. J. Spindler, N. V. Clark and R. A. Dishman. Spaces 190 and 191.

Creepcheck Company, Inc., Hoboken, N. J.—Unit one-piece anti-creeper. Represented by T. D. Crowley, R. R. Dinklage, H. A. Howell, V. L. Walker and W. C. Dawkins. Space 87.

Crerar, Adams & Co., Chicago.—Track tools and machines; jacks and hoists; shovels and scoops; miscellaneous tools. Represented by Russell Wallace, E. C. Poehler, G. D. Bassett, J. M. Temple, W. L. Reidell and R. M. Bullard. Space 28.

Crowe Manufacturing Company, Cincinnati, Ohio.—Electrically and air driven power saws, Type CC9, Type CC16 and Type B12; **air saw.** Represented by J. M. Crowe, George W. Marquardt, S. S. McClure, W. P. Murphy and W. Roy Weldon. **Space 31.**

Cullen-Friestedt Company, Chicago.—Steel cranes. Represented by W. C. Bamber, K. J. Beller, C. J. Bronez, T. D. Crowley, E. V. Cullen, F. J. Cullen, F. P. Cullen, D. W. Dodge, T. B. Fitzwilliam, T. G. Frazee, R. W. Payne, F. J. Reagan, A. G. Schmidt and E. J. Shaughnessy. Spaces 116 and 117.

Curtin-Howe Corporation, New York.—Samples of treated and untreated ties, treated and untreated wood and treated and untreated poles; samples of painted treated wood; zinc meta-arsenite. Represented by C. Marshall Taylor, William R. Fritze, H. J. Lucey and E. H. Walker. Space 151.

Cyclone Fence Company, Waukegan, Ill.—Fencing. Represented by W. K. Sandmeyer, D. J. Tighe, R. R. Reasure, J. E. Newry, E. W. Greene and A. D. Schalck. Space 259.

Dearborn Chemical Company, Chicago.—Water treatment equipment; treating plants; rust preventive. Represented by George R. Carr, F. B. Horstmann, H. B. Crooker, C. M. Hoffman, E. M. Converse and C. F. Barham. Spaces 251 and 252.

Detroit Graphite Company, Chicago.—Paint; examples of its use. Represented by T. R. Wyles, P. L. Maury, L. F. Flanagan, L. D. Mitchell, W. D. Waugh, R. H. Ming, J. R. C. Hintz and A. B. Edge. Spaces 58 and 59.

De Vilbiss Company, Toledo, Ohio.—Freight car and locomotive painting spray gun, Type NR; masking paper; liquid spray shield; hose cleaner; pressure feed paint tanks; suction feed cups; bridge, building and maintenance spray painting outfit, Type TM-601; one man spray painting outfit, Type NM-606; dustproof respirator, Type MS and Type MB; goggles; hose hanger hooks; **spray gun, Type AV; touch-up outfit, Type AP-609.** Represented by W. D. Bokelman, B. C. Gardner, W. F. Gradolph, R. A. Gyer, W. C. Hearn, H. H. Lorton, R. W. Overmeyer and E. G. Whitmore. Spaces 288 and 289.

Dickinson, Inc., Paul, Chicago.—Models and full size smoke jacks, chimneys and ventilators; exhaust heads; roof drains; warehouse scuppers. Represented by A. J. Filkins, A. E. Engman and H. Knutson. Space 98.

Dilworth, Porter & Co., Inc., Pittsburgh, Pa.—Tie plates; boat, barge and railroad spikes; tie rods; automobile axles; special die rolled sections. Represented by Joseph Dilworth and W. C. Emory. Space 27.

Duff-Norton Manufacturing Company, Pittsburgh, Pa.—Jacks; **jack.** Represented by C. N. Thulin, E. E. Thulin, H. J. Wilson, O. L. Wright and W. G. Robb. Spaces 35 and 36.

Edison, Inc., Thomas A., Bloomfield, N. J.—Top post mechanism semaphore signal operated direct from 16 primary cells; miniature crossing gate equipped with electric lamp and having a self-contained gravity circuit breaker; all-electric color-light train order installation with red and yellow daylight signals controlled through a desk type circuit controller and operated from 12 primary cells; wig-wag type highway crossing signal operated from 12 primary cells; railway color-light signal installation operated from trickle charged storage cells of the B-4H type; searchlight type color-light signal installation operated from A. C. primary system; highway crossing flashlight signal installation operated from A-C. primary system; switch stand installation with oil lamp which has been converted to electric by means of universal adapter; track battery installation; primary and storage cells; nite box; electric lighting accessories; **switch for use instead of A. R. A. terminal block.** Spaces 18, 19 and 20.

Edison Storage Battery Company, Orange, N. J.—Exhibit combined with that of Thomas A. Edison, Inc. Spaces 18, **19 and 20.**

Electric Railway Improvement Company, Cleveland, Ohio.—Signal and propulsion gas weld bonds; **gas weld signal bonds.** Represented by F. H. Neff, W. E. Huber, E. B. Moore, P. T. Bevers and L. J. Rinker. Space 223.

Electric Railweld Service Corporation, Chicago—Electric welding equipment; **various improved machines.** Represented by H. E. McKee, M. H. Turner, E. F. Smith, B. E. Melton, W. W. Shigley, Henry Light and Chas. Hagler. Spaces 221 and 222.

Electric Service Supplies Company, Philadelphia, Pa.—Crystal valve signal lightning arresters; flood lights; insulators; turbo-generators; lamp guards. Represented by Max A. Berg, J. F. Carper, F. G. MacRae, C. V. Root, H. J. Graham and Marion R. Lyons. Space 171½.

Electric Storage Battery Company, Philadelphia.—Chloride-accumulator storage battery cells for railway signal and similar services; glass jar signal cells; portable type signal cells; track circuit working model. Represented by H. B. Crantford, E. H. Watkins, E. L. Lord, E. Bishop, H. S. Folk, C. A. Daunt, W. C. Leingang, C. B. Archibald, R. O. Miles, W. H. Payne, F. C. Owens, W. R. Knappenberger, A. M. Ripley and C. B. McCormick. Space 40.

Electric Tamper & Equipment Co., Chicago.—Electric tie tampers and power plants; **concrete vibrating machines.** Represented by C. Jackson, Ray Cartier, V. G. Cartier, H. W. Cutshall, M. I. McCarty and J. E. Deignan. Spaces 205 and 210.

Elwell Parker Electric Company, Chicago.—Electric crane trucks; electric tractors for freight and stores depart

Typical Views of the N. R. A. A. Exhibit at the Coliseum

ment service. Represented by George W. Brown, C. E. Cochrane, Arthur Dobler, H. Du Maire, George C. Isbester and Henry F. Ostrander. Spaces 246 and 247.

Engineering News-Record, New York.—Copies of industrial publications. Represented by A. B. Cozzens and F. G. Hudson. Space 155.

Fairbanks, Morse & Co., Chicago.—Motor cars; trailer car; electric motors; centrifugal pumps; turbine pump; scale; **standpipe.** Represented by P. H. Gilleland, G. Howard, D. K. Lee, E. C. Golladay, H. E. Vogel, R. F. Lane, W. L. Nies, W. F. Anderson, E. P. Vroome, F. M. Condit, L. H. Matthews, F. J. Lee, C. H. Wilson, E. P. Chase, C. B. O'Neil, G. W. Lewis, J. T. Frame, C. G. Mahana, H. L. Hilleary, C. T. Fugitt, B. S. Spaulding, J. L. Jones, E. J. Coverdale, H. J. Smith, J. A. Sleer, J. C. Flanagan, and W. C. Dehn. Spaces 73, 74, 75, 76, 92, 93, 94 and 95.

Fairmont Railway Motors, Inc.—Motor cars, Class C-1, MM-9, M-19; section motor cars, Class A-4, A-5, A-2, M-2; Class M quiet mower; Class M-22 compressor car; models of wheel axles and bearings; photographs of work equipment. Represented by H. E. Wade, Robert D. Sinclair, W. F. Kasper, A. C. Force, H. M. Stanett, J. P. Dunning, W. D. Brooks, C. H. Johnson, K. K. Cavins, A. R. Fletcher, E. L. Clarke, C. W. Brhel, C. F. Green, V. Padgett, C. P. Benning, J. T. McMahon, L. M. Granger, C. J. Dammann, W. R. Walters, W. M. Williamson, H. A. Sly, F. C. Whitehouse, L. R. Payton, R. W. Jamison and R. W. Payne. Spaces 145, 146, 147 and 148.

Fuller & Johnson Manufacturing Company, Madison, Wis.—Gasoline and kerosene engines, 2¼ hp. and 2½ hp. Model NC for lighting plants, Model AH single cylinder vertical, Model BCL, Model BCR, 20 hp. four cylinder for industrial purposes; farm pump engine in operation; self-contained magneto-equipped power and light unit; **Model XA four cylinder 20 hp. engine; Model BB two cylinder vertical 5 hp. engine.** Represented by C. L. McMullen, E. D. McClelland, B. A. Weideman and G. D. Stone. Space 188.

Gardner-Denver Company, Quincy, Ill.—Portable tie tamper of 110-cu. ft. displacement; concrete wreckers; air line lubricator; clay digger; hand hammers. Represented by Richard Bower, Tom Driscoll, Howard Dwight, Ralph Farris, Lawrence Loewe, Emmett Shaughennesy and Roy Watson. Space 219½.

General Electric Company, Schenectady, N. Y.—Pole type capacitors, cutouts and lightning arresters; railroad crossing signals; research laboratory display consisting of thyratron tubes with carbon and photo-electric control, telsa coil, high frequency furnace, balanced circuit photo electric equipment, streamer discharge, selsyn motors, neon and mercury arc lamps, photo-electric tube photometer, photo elasticity or visible strain, voice controlled train and photophone transparencies. Represented by W. A. Gluesing. Spaces 270, 271, 272 and 273.

General Railway Signal Company, Rochester, N. Y.—Dispatching machine including lever machine, Type D color light signals, Type SA Color light signal, Model 2 Form B dual control switch machine, Type K neutral and polar relays and Type R remote control relay; Type F relay for approach lighting; Type G relay for reserve indication; Type H power-off relay; Model 2 Form A a-c. polyphase relay; Type K transformer; Type K½ transformer; Type K force drop electric lock; Model 7 switch circuit controller; highway crossing color light unit; rheometer, genrench set **continuous selective cab signal control system; Type K D-C neutral and polar relays; Type T thermal relay; Type L relay a-c. vane; Type S transformer; Model 5 Form A interlocking machine lever; force drop electric lock for mechanical interlocking machines; Model 5B dual-control switch machine.** Represented by F. Benedict, F. Braam, T. H. Branson, N. C. L. Brown, S. C. Bryant, P. E. Carter, W. D. Cloud, R. C. Connell, E. P. Crane, S. M. Day, O. W. Dewitt, F. Dodgson, O. S. Field, J. A. Geneser, R. Gould, W. D. Hailes, C. L. Hacket, W. S. Henry, C. Henz, A. C. Holden, W. K. Howe, S. G. Johnson, J. F. Kelly, E. W. Kolb, J. C. Linder, H. W. Lucia, F. W. Moffett, A. G. Moore, A. H. Nasher, R M. Phinney, N. D. Preston, W. H. Reichard, Paul Renshaw, F. W. Rizer, A. C. Scherer, A. C. Smith, J. E. Stephenson, E. W. Stone, L. Thomas, A. Thomson, H. C. Ware, W. W. Wenholz, S. N. Wight, J. R. Wills and W. H. Workman. Spaces 48, 49 and 50.

Gould Storage Battery, New York.—**Storage batteries,** using glass mat retainer; **storage batteries for signal service with glass mat retainer.** Represented by E. J. Mohr, C. W. Bell, L. C. Hensel, A. M. Andersen and A. J. Davis. Space 2.

Graham Bolt & Nut Co., Pittsburgh, Pa.—Bolting materials; **bolts; selflock unit nuts.** Represented by W. E. Fowler, Jr., W. C. Masters and H. G. Doran. Spaces 229 and 230.

Griswold Safety Signal Company, Minneapolis, Minn.—Highway crossing signals. Represented by F. W. Griswold, M. H. Hovey, H. H. Steele and E. W. Bofferding. Space 181.

Harnischfeger Corporation, Milwaukee, Wis.—Model of 1 yd. capacity gasoline or diesel excavator; motion and still pictures of supply train cranes, ditchers and draglines. Represented by J. C. Bloomfield, N. P. Farrar, H. S. Strouse, H. Walcott, F. Liebich and H. M. Davison. Space 156.

Hayes Track Appliance Company, Richmond, Ind.—Sliding type derail with two-tie operating stand; hingled type derail with target stand; portable derail with staff and blue vane; quarter size model of Type W bumping post; moving exhibit of sliding type derail; **Type S wheel stop.** Represented by Walter Boorom, Oran G. Perry, Edgar W. Brown, Paul C. McClure, S. W. Hayes, Thomas B. Keal, Herbert J. Mayer, Sterling P. Reid, Ernst L. Ruby and F. C. Stowell. Spaces 140 and 141.

Headley Good Roads Company, Philadelphia, Pa.—Emulsified asphalts, No. 10, No. 10a, and No. 11 for roofing, waterproofing, painting, insulating and flooring. Represented by W. T. Gilbert, E. J. Hunt, F. X. Kern, E. S. Ross, Welborne Hope, T. B. Headley and M. W. Lefever. Spaces 157½, 158 and 159.

Heider Industrial Chemical Company, Columbus, Ohio.—Poisonous and non-poisonous chemical weed killer; spray equipment for applying weed killer; **pneumatic movement and control of spray arms on spray equipment; motion pictures showing manufacture of equipment and spray in operation.** Represented by A. H. Heider and T. G. Dixon. Space 225.

Hubbard & Co., Pittsburgh, Pa.—Track tools, lock washers; track shovels; **super-steel alloy track shovels, adzes, spike mauls, clay pick and tamper.** Represented by John S. Wincrantz, W. H. Remmel, Stuart Remmel and Chris Konald. Space 86.

Illinois Steel Company, Chicago.—Steel car and locomotive wheels; track spikes; screw spikes; track bolts and nuts; tie plates; rail joints; angle bars; floor plate. Represented by O. H. Baker, C. B. Friday, N. M. Hench, L. G. Hagen, J. R. McElveen, C. R. Moffatt, John Brunner, R. G. Glass, J. Hornbrook, E. E. Hedberg, Grant Monk, S. W. Wheelock, Geo. G. Titzell, Jr., W. B. Weston, W. J. Totten, A. H. Warren, D. T. Buffington, R. Korsan, Jr., and S. L. Graham. Spaces 269 and 274.

Indianapolis Switch & Frog Co., Springfield, Ohio.—Welding steel for rails and frogs; metal paving units for grade crossings; **cushioned metal paver units.** Represented by E. C. Price and T. L. Hanley. Spaces 50½ and 52.

Ingersoll-Rand Company, New York.—Portable compressors for track work, both self propelled and non-self propelled; pneumatic tools applicable to track work; tie tampers; spike drivers; spike pullers; pneumatic wrenches; rail drills; bond drills; grinding machine; screw spike setting machine; hoists; pumps. Represented by W. H. Armstrong, G. W. Morrow, G. E. Bridge, T. H. Weigand, J. R. Randle, E. C. Geither, F. J. Ursem, F. D. McDermott, J. N. Thorp, E. F. Kultchar and L. A. Luther. Spaces 206, 207, 208 and 209.

Jewell Electrical Instrument Company, Chicago.—Indicating instruments for alternating and direct current measurements, including voltmeters, ammeters, watt meters, volt-ammeters, single or multi-scale; tube checkers for PJ4 tubes; special headlight voltmeters; **supervisors special test kit.** Represented by E. E. Stolp, J. H. Miller, L. C. Herrmann, G. H. Koch and W. T. Walter. Space 123.

Johns-Manville Corporation, New York.—Corrugated transite for sides and roofs of buildings; transite asbestos shingles; asbestos roofing; built up asbestos roofing; smoke jacks; insulating materials, fire decking for bridges; waterproofing; bridge surfacing compound; mastic floors for shops and freight houses; ebony asbestos wood for switch board handles; insulating bricks; rock wool insulating materials; power plant packing; acoustical correction materials. Represented by P. R. Austin, D. B. Bell, G. K. Bradfield, C. E. Bryant, W. B. Busch, C. S. Clingham, E. L. Colopy, J. S. Doyle, A. F. Eichhorn, H. Flannigan, E. Fairback, C. D. Folsam, W. D. Goddard, H. H. Grece, H. T. Hankins, W. J. Hennessy, H. D. Hitchcock, F. J. Horne, J. D. Johnson, W. H. Lawrence, H. L. Leach, D. M. Lewis, W. B. Ludlow, P. D. Mallay, C. E. Murphy, G. A. Nicol, Jr., R. J. Offutt, T. J. O'Leary, W. B. O'Neill, L. Papineau, C. M. Patten, A. C. Pickett, H. R. Poulson, B. J. Queen, P. E. Redding, E. O. Roby, H. B. Sewell, R. C. Simmons, A. H. Sisson, W. F. Stewart, R. P. Townsend, J. H. Trent and J. C. Younglove. Spaces 174, 175, 176 and 177.

Jordan Company, O. F., East Chicago, Ind.—Railroad spreaders, ditchers and snow plows; railroad track oiler and

spraying machine. Represented by A. L. Greenabaum, A. W. Banton, J. F. Curtis, Alfred Jones, J. C. Forbes, and J. E. Wheeler. Spaces 60, 61 and 62.

Joyce-Cridland Company, Dayton, Ohio.—Track jacks; journal jacks; car and locomotive jacks; motor driven jack hoists for heavy work; **track jack; journal jack; air motor driven ball bearing geared screw jack hoist.** Represented by Harry Brock, Huston Brown, A. S. Beattys and O. H. Sneed. **Space 192.**

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Motor cars, No. 23, No. 25A; unassembled motor car engine; track gages; track levels; track drills; **motor cars, No. 216L, No. 216, No. 22, No. 250, No. 55-12.** Represented by Frank E. McAllister, Lacy Hofius, R. E. Keller, L. W. Bates, Rodney Pennoyar, W. A. McCallum, P. Robischung, F. S. Smith and L. W. Boswell. Spaces 8, 8½, 8¾, 23, 24 and 25.

K. & W. Equipment Company, Chicago.—Photographs of rail layer. Represented by A. Verne Jackson. Space 42.

Kerite Insulated Wire & Cable Co., Inc., New York.—Wires and cables. Represented by W. H. Fenley, J. W. Young, J. A. Hamilton, J. A. Renton, O. B. Frink, J. P. Robinson, E. L. Adams, C. A. Reeb, M. D. Cook, C. M. Deardorff, C. E. Hieber, E. M. Branchfield and H. J. Harrel. Spaces 88 and 107.

Keystone Grinder and Manufacturing Company, Pittsburgh, Pa.—Railroad tool grinders and attachments; **attachment for redressing railcutters.** Represented by L. J. Cooney and S. S. Newman. Space 115.

S. P. McGough, J. A. McHugh, H. Honaghan, R. H. Noderer, Edward Ott, L. M. Schrufer, Louis Stavachik, H. C. Stiff, H. Toussaint, J. G. Vance and D. P. Steward. Spaces 266, 267, 276 and 277.

Louisville Frog, Switch and Signal Company, Louisville, Ky.—Signal and track materials; reflector signs; relays; bootleg connector; guard rail clamp. Represented by F. W. Carter, J. S. Drillette, E. A. Mann, L. R. Sehnder, E. A. Butler, Walter Church and T. L. Mount. Spaces 262, 263, 280 and 281.

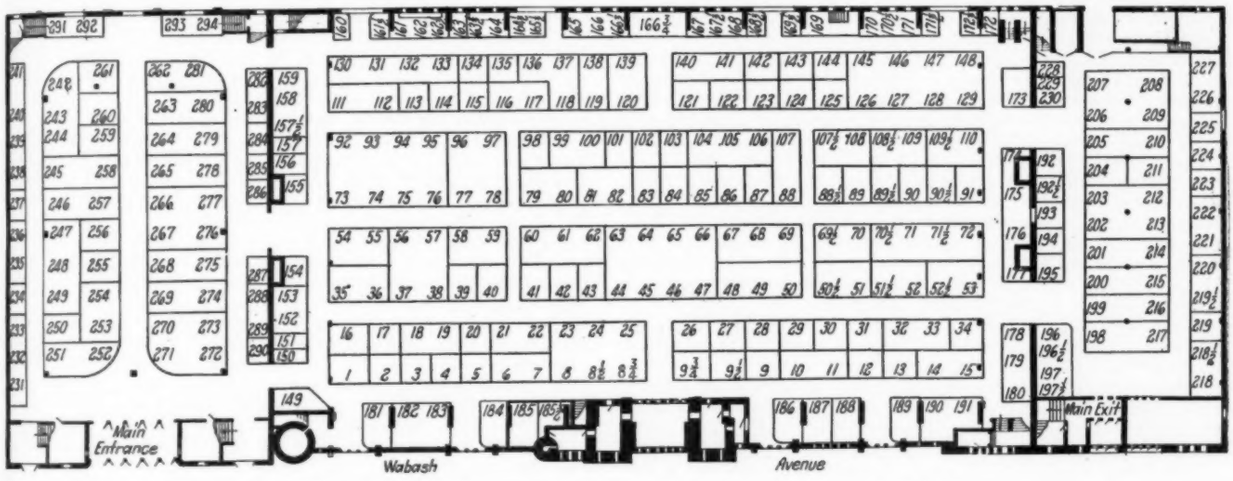
Lufkin Rule Company, Saginaw, Mich.—Tapes; rules; machinist tools; **extra heavy type for rough work.** Represented by Theo. P. Young, R. M. Benjamin and Alfred Huss. Space 121.

Lundie Engineering Corporation, New York.—Tie plates. Represented by L. B. Armstrong, James C. Barr, Eugene Brandeis, John Lundie, G. W. Nibbe, Robert L. Nutt, Jr., and Charles W. Stone. Space 89.

Lundy Corporation, E. A., Pittsburgh, Pa.—Rectifier; bonds; reinforced switch clips; electric switch lamps; charging outfit. Represented by C. E. Stryker, E. A. Lundy, N. A. Kogler, D. C. Wilson, R. B. Arnold and C. F. Hopkins. Spaces 238, 239, 240 and 241.

MacLean-Fogg Lock Nut Company, Chicago.—Lock nuts. Represented by J. A. MacLean, J. W. Fogg, W. G. Willcoxson, A. W. MacLean and J. A. MacLean, Jr. Space 1.

MacRae's Blue Book Company, Chicago.—Copies of MacRae's Blue Book. Represented by T. H. MacRae, L. Simonson, C. Hill, L. Wrenn, R. H. Morrison, G. M. Hamilton,



Floor Plan of the Coliseum and Annex, Showing Location of Exhibits

Kokomo Stamped Metal Company, Kokomo, Ind.—Weed cutter. Represented by L. L. Ludlow. Space 193.

Koppel Industrial Car & Equipment Co., Koppel, Pa.—Photographs and literature concerning air dump cars; **rolling trunnion type air dump car.** Represented by H. W. Redman, W. W. Stewart and H. E. Chilcoat. Space 285.

Layne & Bowler, Inc., Memphis, Tenn.—Gravel wall well; combination hollow shaft motor and belted head; shutter screen. Represented by L. D. Mickley. Space 89½.

Le Carbone Co., Hoboken, N. J.—Primary batteries; **new type primary battery.** Represented by H. G. Thompson, D. B. Hughes and W. D. Nelson. Space 9¾.

Lehon Company, Chicago.—Building roofings, car specialties such as waterproof insulating papers, fabrics and compounds. Represented by Tom Lehon, J. W. Shoop, John Eipper, H. A. Wolfe, and F. A. Locke. Space 91.

The Locomotive Finished Material Company, Atchison, Kan.—Highway crossings; **improved crossing.** Represented by C. Hastings and R. L. McIntosh. Space 103.

Long Company, Chas. R., Jr., Louisville, Ky.—Railway paints, varnishes and lacquers. Represented by Samuel D. Demarest and Kenneth E. Clarke. Space 185.

Lorain Steel Company, Chicago.—Forged combination joints, rail braces, slide plates and foot guards; manganese steel insert crossing frog; switch stand; No. 10 manganese steel self guarded frog; No. 10 spring rail frog; No. 8 iron bound manganese steel center frog; heat treated sample which has been kinked 30 deg.; taper rail; expansion joint; gage rod; **heat treated point rail.** Represented by W. H. Andrews, S. J. Cotsworth, J. S. Duryea, Otto Fischer, A. L. George, H. L. Gleeson, William Lynam, H. H. McDonald, Alex Smith, F. O. Rice, A. Schlarbaum, W. P. Dent, C. S. Wallace and W. J. McCamman. Space 287.

Magnetic Signal Company, Los Angeles, Cal.—Rail expander; rail inspector; magnetic wigwag signal with auxiliary out-of-order apparatus. Represented by T. E. Akers, Laurence Boswell, J. E. Davidson, Ralph W. Payne, H. W. Renick and J. V. Westcott. Space 90½.

Maintenance Equipment Company, Chicago.—Automatic rail and flange lubricator; friction car stop; reversible switch point protector; power track ballaster; three man rail laying machine; **rail and flange lubricator.** Represented by H. C. Holloway, J. A. Roche, E. Overmier, D. S. Hoffman, A. Arnold and H. Muhs. Spaces 118, 136 and 137.

Massey Concrete Products Corporation, Chicago.—Pipe; cribbing; battery boxes; **RSA battery box.** Represented by G. H. Redding, H. W. Wilder, E. C. Alexander, W. H. Robertson, D. A. Hultgren, E. M. Hatheway, W. L. McDaniel, C. H. Hunsaker, Charles Gilman, J. A. Higgs, Jr., N. E. Cloud, P. E. Longstreet and E. S. Humphrys, Jr. Spaces 54 and 55.

Mechanical Manufacturing Company, Chicago.—Bumping posts; **thermal heating units.** Represented by H. E. Johnson and T. L. Zapf. Spaces 245 and 258.

Metal & Thermit Corporation, New York.—Welding equipment and welded samples. Represented by John B. Tinnon, C. D. Young and L. G. Vock. Spaces 198 and 217.

Metalweld, Inc., Philadelphia, Pa.—**Two hundred and ten cu. ft. rail car compressor; cut section of 110-cu. ft. compressor.** Represented by J. S. Oechsle, C. F. Oechsle, Wm. M. Vinnedge, Albert Watson and P. A. Blakely. Space 211.

Mississippi Valley Structural Steel Co., Decatur, Ill.—

Reformed joint bars; structural steel. Represented by A. S. Blan, R. D. Wood, J. K. Stafford and H. H. Cosley. Space 250.

Morden Frog & Crossing Works, Chicago.—Adjustable rail brace; universal foot guard; manganese frog; guard rails; compromise joint; miscellaneous frog and switch material. Represented by B. T. Gibbs, W. H. Hartz, Geo. F. Killmer, R. A. Brown, J. F. Karcher, W. J. W. Gilbert; Samuel Withrow. Spaces 69½ and 70.

Murdock Manufacturing & Supply Company, Cincinnati, Ohio.—Railway water service boxes; railway air valves; drinking fountains; anti-freezing hydrants; **air valve.** Represented by J. C. Endebrock and J. C. Endebrock, Jr. Space 134.

National Boiler Washing Company of Illinois, Chicago.—Motion pictures of hot water blow-off, washout and filling up systems. Represented by Spencer Otis, Frederick A. Gale, J. S. Maurer, Spencer Otis, Jr., and F. W. Gale. Space 12.

National Carbon Company, Inc., New York.—Signal cells; flashlight cases and cells; dry cells; hot shots; portable lights. Represented by D. H. Green, P. G. Sendorf, M. D. Rees, J. S. Gemmel, L. R. Griffin and J. M. Hickey. Spaces 9, 10 and 11.

National Lead Company, New York.—Lead products. Represented by F. M. Hartley, Jr., A. H. Sabin, F. E. Dodge and W. A. Carlisle. Space 186.

National Lock Washer Company, Newark, N. J.—Spring washer. Represented by C. H. Loutrel, W. H. Reaves, Allen T. Hyatt, G. LaRue Masters, Stanley H. Smith, Waldo Bugbee, F. B. Archibald, Geo. H. Goodell, R. L. Cairncross and W. R. Hillary. Space 114.

National Railway Signal Company, Boston, Mass.—Signal accessories and train control; **type C power off relay; type H neutral relay; type N. A. L. relay.** Represented by Ed. C. Wilson, J. C. Anderson and C. E. Sampson. Space 149.

National Vulcanized Fibre Company, Wilmington, Del.—Fibre for rail joint, switch rod, steel cross tie and bridge insulation; laminated bakelite shown in its various uses. Represented by Warren J. Marshall, J. K. Johnston, H. C. Hackett, C. C. Bell, Albert J. Cox, G. W. Glaescher, R. C. Farquhar, R. F. Hunt and John Barron. Space 125.

Nelson Manufacturing Company, B. F., Minneapolis, Minn.—Asphalt shingles; car roofings and insulations. Represented by E. H. Batchelder. Space 13.

New Jersey Zinc Sales Company, New York.—**Non-rusting metal roofing and siding.** Represented by D. P. Brannin, Mr. Burns and Mr. Whitlock. Space 195.

Nichols & Bros., Geo. P., Chicago.—Roller bearings for turntables and rolling stock; control devices for turntables; model of transfer table. Represented by S. F. Nichols, H. P. Notley and N. Fries. Space 173.

Nordberg Manufacturing Company, Milwaukee, Wis.—Motion pictures of jacks, and adzing machines, track machines and track cranes in use; outdoor demonstrations of the use of track crane and track shifter; **power jack; adzing machine.** Represented by H. H. Talboys, V. F. Larson, W. W. Fitz Patrick, C. S. Rogers and Robert R. Jones. Spaces 201 and 214.

Northfield Iron Company, Northfield, Minn.—Garage or shop oil burner; mortar or concrete mixer; **snow fence.** Represented by C. L. Brown and R. D. Brown. Space 224.

Northwest Engineering Company, Chicago.—**Three-fourth yd. capacity convertible crawler dragline, gasoline powered.** Represented by Wm. S. Miller and G. C. Williams. Spaces 247, 248 and 249.

Northwestern Motor Company, Eau Claire, Wis.—No. 523 section car; No. 551 heavy duty section car; No. 581 ball discer; cut out transmission; cut out engine. Represented by Walter H. Allen, F. W. Anderson, Verne Coates, W. J. Church, Allen L. Batesman, O. B. Duncan, G. H. Goodell, C. Hoppe, R. E. Hotchkiss, W. Newton Jeffress, T. C. King, A. Loomis, R. N. Miller, A. H. Nelson, J. H. Perry, Jr., O. Phillip, W. J. Roehl and R. R. Rosholt. Spaces 196, 196½, 197 and 197½.

Ohio Brass Company, Mansfield, Ohio.—Propulsion rail bonds; signal bonds; catenary fittings; porcelain insulators; **car couplers.** Represented by F. F. Seeburger, O. M. Hullinger, J. B. Weigel, D. H. Moore, J. R. Palmer, W. P. Bovard, P. P. Pipes, A. B. Price, C. H. Tomlinson, Howard O'Dell and Marshall McCormick. Spaces 253 and 254.

Ohio Valley Rock Asphalt Company, Louisville, Ky.—Model demonstrating Kentucky rock asphalt highway crossing. Represented by Geo. W. Rapp, Jas. B. Wilson, S. O. LeSueur and Harry S. Marshall. Space 150.

Paasche Airbrush Company, Chicago.—Air painting devices; **railway maintenance air devices.** Represented by W. E. Butterman, B. E. Hurlburt and M. Stephenson. Spaces 282 and 283.

Okonite-Callender Cable Company, Inc., Passaic, N. J.—Signal wires and cables; power cables; train control wire; friction tapes; splicing compound. Represented by R. N. Baker, Carl P. Brodhun, C. E. Brown, Jr., J. W. Hackett, H. A. Hamilton, L. R. Mann, A. L. McNeill, E. H. McNeill, P. W. Miller, J. J. O'Brien, J. Delmar Underhill, W. R. Van Steenburgh and F. J. White. Space 17.

Okonite Company, Passaic, N. J.—Signal wire and cables; power cables; train control wire; friction tapes; spicing compound. Representatives the same as those listed under Okonite-Callender Company in space 17. Space 16.

Oxweld Railroad Service Company, Carbic Division, Chicago.—Carbic generators; flare lights; **headlight unit.** Represented by the same men listed under Oxweld Railroad Service Company. Spaces 165, 166 and 166½.

Oxweld Railroad Service Company, Chicago.—Cutting and welding apparatus; **portable Prest-O-Lite motor car.** Represented by F. C. Hasse, H. W. Schulze, W. A. Hogan, A. N. Lucas, L. C. Ryan, W. H. Kofmehl, C. A. Bloom, D. H. Pittman, F. A. Lurquin, L. A. Woodward, A. S. Jones, J. Holubar, W. E. Campbell, F. J. Duffie, S. P. Donegan and J. E. Winslow. Spaces 10 and 11.

P. & M. Company, Chicago.—Rail anchors; bond wire protectors. Represented by F. A. Preston, D. T. Hallberg, L. S. Walker, T. E. Rodman, G. E. Webster, S. M. Clancey, J. J. Gallagher, W. H. Reaves, J. E. Mahoney, W. A. Maxwell, H. W. Keevil, M. K. Ruppert, P. H. Hamilton, G. E. Olson, W. G. Cunningham, L. E. Borst, C. H. Norwood, G. E. Johnson, and T. J. Byrne. Spaces 119 and 138.

Page Steel & Wire Company, Bridgeport, Conn.—Iron bond wires; iron line wire; welding wire; wire strand; right-of-way fence; chain link fence; highway guard. Represented by W. A. Berner, D. B. Currie, E. J. Flood, L. C. Hoff and W. T. Kyle. Space 83.

Pettibone-Mulliken Company, Chicago.—Guard rails; switch stands; frogs; articulated crossing; **mechanical switchman; guard rail.** Represented by C. H. Eib, A. Swartz, C. Johnson and G. J. Slibeck. Spaces 242, 243 and 244.

Pocket List of Railroad Officials, New York.—Copies of the Pocket List of Railroad Officials. Represented by J. Alexander Brown, Harold A. Brown and B. J. Wilson. Space 26.

Pyle-National Company, Chicago.—Floodlighting projectors in cast and sheet metal; train control equipment; electric wiring devices; headlight cases; turbo-generators; **sheet metal floodlights.** Represented by J. Will Johnson, P. S. Westcott, William Miller, J. J. Kennedy, W. A. Ross, W. H. East and J. A. Amos. Spaces 37, 38, 56 and 57.

Positive Rail Anchor Company, Chicago.—Rail anchors; rail braces; malleable iron tie plates; guard rail plates and braces; guard rail chairs. Represented by A. H. Told, L. C. Ferguson, J. Shoulty, A. C. Moore and E. E. Griest. Spaces 178, 179 and 180.

Prendergast Company, Marion, Ohio.—**Concrete crossing slabs in place in track; concrete fence posts; rail rest whistle post, and other concrete railway products; section of track with asphalt pavement; quarry and mill samples.** Represented by J. F. Prendergast, J. R. Smith, F. H. Weber, J. E. Hogan, S. H. Smith, C. S. Jordan, C. M. Smith, G. L. Hiner, G. T. Nagel, C. E. Patty, G. C. Baker, C. E. Glander, R. W. Sanders and W. N. Bosler. Spaces 200 and 215.

Q. & C. Company, New York.—One piece manganese guard rail; electric snow melters; rolled steel compromise joint, switch point guard; guard rail clamps; derails; **anti-slip rail tongs.** Represented by E. R. Packer, J. L. Terry, L. Thomas, H. T. Henry, E. M. Smith, L. Hassman, L. T. Burwell and F. F. Kister. Spaces 120 and 139.

Racor Pacific Frog & Switch Company, Los Angeles, Cal.—Exhibit combined with that of Ramapo Ajax Corporation. Represented by R. M. Evans, M. J. Henehan, Lacy Hofius, Rodney Pennoyer, H. W. Renick and J. B. Strong. Space 109½.

Rail Joint Company, New York.—Rail joints. Represented by V. C. Armstrong, E. A. Condit, W. P. Thomson, James C. Barr, Alex Chapman, G. A. Disbrow, J. A. Greer, H. C. Hickey, J. H. Larmonth, J. G. Miller, R. W. Payne, E. F. Schermerhorn, R. R. Seward, McL. Thomson, D. P. Wolhaupter, Emmett Bishop, D. L. Braine, G. M. Clodfelter, J. G. Delfox, W. E. Gadd, C. B. Griffin, Charles Jenkinson, G. H. Larson, Milton Markley, J. N. Meade, Thomas Ryan and L. D. Whitaker. Spaces 79 and 80.

Railroad Accessories Corporation, New York.—Rail bonds; paper bonding drill; lightning arresters; electric lamps; parkway risers; power nut runner and track drill;

spike puller. Represented by F. C. Davarack, B. A. Lundy, W. J. Burns, E. M. Deems and S. G. Ellis. Spaces 14 and 15.

Railroad Herald, Atlanta, Ga.—Copies of publication. Represented by E. C. Laird. Space 169½.

Railroad Supply Company, Chicago.—Highway crossing protection devices; signal accessories; tie plates and track appliances; **No. 3900 rotating type stop signal; No. 4000 flasher; rectifiers; transformers.** Represented by E. H. Bell, R. E. Bell, W. S. Boyce, H. M. Buck, V. Coates, T. H. Cole, J. C. Duranceau, C. G. Elliott, M. J. Fox, R. D. Hawley, John Hensel, F. M. Hill, P. W. Kohnen, S. Miskelly, A. C. Reid, Arthur H. Smith, Geo. T. Willard and J. C. Willson. Spaces 104, 105 and 106.

Railway Maintenance Corporation, Pittsburgh, Pa.—Ballast cleaning machine. Represented by J. B. McWilliams and John F. Casey, Jr. Space 261.

Railway Purchases and Stores, Chicago.—Copies of publication. Represented by E. Wray, H. B. Kirkland, J. P. Murphy, Jr., and K. F. Sheeran. Space 154.

Ramapo Ajax Corporation.—Switch point with accessories; manganese switch with adjustable clips; manganese flange switch guard; manganese one-piece guard rail; rail expander; automatic safety switch stands; positive gearless switch stand; guard rail clamp; adjustable rail braces; drop forged rail braces; open side switch clips; double shoulder switch plates; oil cylinder dash pot; rail inspector; switch locking device; non-derailer; articulated manganese crossing; gage rods. Represented by T. E. Akers, W. Bender, G. A. Carlson, G. M. Cooper, J. V. Cowling, J. E. Davidson, S. Dolan, D. Fairback, W. J. Fairback, D. F. Hilton, P. Hoffman, J. V. Houston, J. S. Hutchins, R. W. Payne, W. A. Peddle, H. W. Renick and J. B. Strong. Space 110.

Rawls Manufacturing Company, Streator, Ill.—Heavy duty axle drive sickle railway mower; heavy duty engine drive sickle railway mower; **type "J" engine drive mower.** Represented by S. E. Rawls, N. H. Greer, W. F. Armstrong, S. Shots, C. A. Huntington and E. J. Jaeger. Spaces 226 and 227.

Reade Manufacturing Company, Jersey City, N. J.—**Triple track spray equipment, mounted on flat car; additional rolling stock; work train, including tank cars; locomotive and caboose shown in oil painting behind spray car; moving pictures showing application of chemical weed killer; and operation of single and multiple track equipments and motor car driven outfit.** Represented by C. H. Reade, R. W. Pritchard, T. B. Bowman, B. Barnes, D. M. DeWitt and K. E. Danielson. Space 256.

Reed-Prentice Corporation, Worcester, Mass.—Portable timber sawing machines, alternating current, direct current and air driven. Represented by B. E. Hurlbut, Geo. W. McIntyre and F. W. McIntyre. Space 284.

Reliance Manufacturing Company, Massillon, Ohio.—Spring washers. Represented by T. A. Spuhler, H. J. McGinn, E. C. Cross and R. L. Shireman. Space 135.

Richards-Wilcox Manufacturing Company, Aurora, Ill.—No. 434 industrial door hardware with No. 448 doors for roundhouse and machine shop door openings; No. 925 ball bearing I-beam trolleys; heavy door hangers and track; heavy ball bearing hinges; door checks. Represented by J. H. Wise, Claude Riemenschneider, William Guay, A. J. LaFleur, A. W. Thurow, E. J. G. Phillips, Clyde Phillips and Anthony Tax. Spaces 170, 170½ and 171.

Roberts Company, Geo. J., Dayton, Ohio.—Continuous water treating plant; electric driven soda ash wayside water treating plant. Represented by H. F. Ostendorf and John C. Jamieson. Spaces 161, 162 and 162½.

Roberts and Schaefer Company, Chicago.—N. & W. Type cinder handling plant and photographs of recent installations; **silent automatic electric hoist.** Represented by Clyde P. Ross and David E. White. Space 34.

Robertson Company, H. H., Pittsburgh, Pa.—Protected metal roofing; siding sheets; ventilators; skylights; sidewall sash; **V-beam sheet for roof decks.** Represented by H. D. Sheets, F. C. Russell, D. W. Jasper and A. R. Gray. Spaces 6 and 7.

Roller-Smith Company, New York.—Electrical measuring instruments; relays; circuit breakers; **Type HEA-3 polyphase ammeter; Type EAF enclosed circuit breaker; Type GSA-3 ammeter; Type GWA voltmeter; Type HWA voltmeter; Type SSA portable a-c. meters; Type SSD portable d-c. meters; Type GSA and GSD a-c. meters in steel cases.** Represented by G. L. Crosby, E. E. Van Cleef and M. B. Mathley. **Space 144.**

Ryerson & Son, Inc., Jos. T., Chicago.—All steel highway crossing; **track arc welders.** Represented by Z. L. Shinkle, T. W. Delanty, J. B. Whitemack and I. B. Yates. Space 260.

Sellers Manufacturing Company, Chicago.—Anchor bottom wrought iron tie plates; arched bottom wrought iron tie plates; anchor bottom wrought iron guard rail tie plates. Represented by J. M. Sellers, R. J. Platt, G. Hogan, R. A. VanHouten, S. H. Smith, F. J. Reagan and A. F. McCoole. Space 124.

Servicised Products Corporation, Chicago.—Bridge flooring; waterproofing protection course planks; premoulded rail filler; expansion joints for concrete construction, webbed type, Type B and other types; raggle blocks and accessories for use in connection with bridge and roof waterproofing; photographs of installations of bridge planking, protection course and other products. Represented by E. W. Hodgkins. Space 286.

Signal Accessories Corporation, Utica, N. Y.—Switch point adjuster; latch lever locks; enameled steel signal blades; roundel protectors; adjustable rail brace; screw locks and keys; bootleg terminals; outlet boxes for bootleg wires; foundation extensions; pipe carriers; **one lever switch machine; switch point clamps; circuit controller for interlocking machines; switch circuit controller; rail brace.** Represented by M. R. Briney, R. B. Arnold and W. R. Burke. Space 113.

Simmons-Boardman Publishing Company, New York.—Copies of Railway Age, Railway Engineering and Maintenance, Railway Signaling, Railway Mechanical Engineer, Railway Electrical Engineer, Airway Age, Boiler Maker, Marine Engineering and Shipping Age, Railway Engineering and Maintenance Cyclopedia; books. Represented by L. B. Sherman, Henry Lee, F. H. Thompson, F. C. Koch, J. G. Little, H. A. Morrison, J. M. Rutherford, H. H. Melville, H. E. McCandless, W. N. Yadon, F. W. Lane, P. D. Juraschek, Samuel O. Dunn, E. T. Howson, W. S. Lacher, J. H. Dunn, D. A. Steel, J. C. Emery, W. F. Rench, F. M. Patterson, N. D. Howard, R. S. Kenrick, Chas. Layng, C. R. Mills and R. W. Beckman. Space 84.

Sinning Track Liner Company, Ramsey, Ill.—Track liners; rail joint adjuster. Represented by Frank R. Sinning, Frank J. Reagan, R. B. Hill and Stanley H. Smith. Space 169½.

Sivyer Steel Casting Company, Milwaukee, Wis.—Guard rail end filler; switch heel filler. Represented by Arthur H. Oberndorfer, Martin A. Fladoes, L. H. Hahn, M. R. Dawley and Paul Thessin. Space 234.

Skelton Shovel Company, Inc., Dunkirk, N. Y.—Shovels; spades; scoops. Represented by E. W. McCarty, H. C. Branahl and C. A. Trigg. Space 9½.

Skilsaw, Inc., Chicago.—**Electric handsaws, Model J, Model E, Model O and Model M for various voltages and adapted to railway uses.** Represented by W. F. Kearn, E. T. Loope, R. M. Newbold, E. W. Ristau, E. P. Schager, L. B. Scott, C. D. Stephenson, B. J. Sullivan and J. W. Sullivan. Space 231½.

Snap-on Wrench Company, Chicago.—Socket wrenches; ratchets; sliding bar handles; extensions; speeders; open end wrenches; hammers, pliers; adjustable end wrenches; special tight socket wrenches; **box socket wrenches; box socket water pump wrenches.** Represented by C. W. Edwards, Josph Johnson, Stanton Palmer, N. E. Tarble and C. H. Tennyson. Space 143.

Snow Construction Company, T. W., Chicago.—Telltales; side warnings; No. 10 water crane valve; relief valves; 50-ton coal chutes; **No. 1 water treating plant; No. 2 water treating plant.** Representd by Barton S. Snow, O. T. Snow, W. A. Lathrop, R. W. Hastings, H. H. Naylor, R. F. Hayes, N. A. Lyle and A. B. Hodgson. Spaces 107½ and 108.

Standard Automatic Signal Corporation, Chicago.—Automatic signal gate with bell and crashing gates, automatically electrically operated. Represented by Duncan L. Clinch, Frank J. Lepreau, C. A. Lyon, H. S. Pardee, Edgar F. Seifert, Edward H. Taylor and Fred Weiss. Spaces 291 and 292.

Standard Oil Company of Indiana, Chicago.—Mechanical exhibit of products; device showing application of asphalt products to railroad equipment. Represented by E. F. Tegtmeyer, F. P. Keane and W. F. Myers. Space 3.

Sunbeam Electric Manufacturing Company, Evansville, Ind.—Headlights; turbo-generators for headlight and train control service; **gas electric plants.** Represented by C. E. Kinnaw and J. Henry Schroeder. **Space 172½.**

Syntron Company, Pittsburgh, Pa.—Electric tie tampers; arc welders; track grinders; portable electric saw; drills; grinders; nut tighteners; spike driers; electric power units; **arc welder; track grinder.** Represented by C. C. Wyandt, Jackson, D. G. Black, E. J. Missien, E. G. Stiles and A. C. A. C. Heath, Jr. Spaces 199 and 216.

Templeton, Kenly & Co., Ltd., Chicago.—Track jacks;

bridge jacks; rail puller and expander; tie spacing shoes; pipe pushers; combination track surfacing and lining jacks. Represented by C. A. Crane, Jr., W. H. Kreer, William Simpson and G. L. Mayer. Spaces 32 and 33.

Toncan Culvert Manufacturers' Association, Massillon, Ohio.—Copper molybdenum iron corrugated culverts and perforated drains; iron boiler tubes; staybolts; fire box plates. Represented by H. J. Bair and Perry Van Horne. Spaces 164½ and 165½.

Torchweld Equipment Company, Chicago.—Gas welding and cutting equipment; **regulators; safety relief valves.** Represented by W. A. Slack, R. C. Gutke, R. M. Smith, C. L. Thompson and J. C. Jensen. Space 5.

Transportation Publishing Company, Los Angeles, Cal.—Copies of publication. Represented by Arthur E. Hooven, Elmer E. Smith and Harold A. Smith. Space 290.

Union Switch & Signal Company, Swissvale, Pa.—Model 13 round base relay; Style M-20 dual control L. V. switch machine, 20 volts; Style RX-10 rectifier; Style T-10 hand operated switch mechanism which locks switch for main line movements; Style RT-10 rectifier; Style NF d-c. flasher relay; Model 12 polarized relay; Model 15 a-c. vane track relay; Style SV-30 a-c. slow release vane relay; Style SLV-13 a-c. vane line relay; Style A-1 electropneumatic switch and lock movement; controller for operation of remote switches and signals; Style TV-30 a-c. vane track relay; Style HC-5 highway crossing flashing light signal; searchlight signal; **Style DX-13 d-c. interlocking relay; Style DP-14 polarized relay; Style RT-5 rectifier; Style DN-11 relay, 8 point; Style ML10 force drop electric lock for all types of mechanical interlocking machines; adjustable shock absorber for relays; Style SE-32 switch lamp and circuit controller; TP clockwork time release for power interlocking machines; Style CP switch valve; Style DN-11 relay, 10 point; Style W-10 transformer; bootleg; Style DN-12 trunnionless relay, 4 point; d-c. searchlight signal relay; Style L-10 d-c. lightout relay; Style D semaphore lamp; switch circuit controller terminals for heavy track leads; 14-way terminal and junction box having vertical terminal boards; Style W-10 transformer; Style DN-11 relay, 4 point; Style DN-11 relay, 6 point; 2-way terminal and junction box with spark gap protector; control panel for dispatcher controlled signal system.** Represented by G. A. Blackmore, B. T. Anderson, L. F. Howard, C. R. Beall, J. P. Coleman, W. H. Cadwallader, M. L. Gray, W. B. Rudd, J. F. Talbert, K. E. Kellenberger, W. C. McWhirter, W. P. Allen, H. W. Griffin, A. Dean, J. E. McCaulley, H. McCready, E. A. Warner, W. J. Gillingham, J. J. Cozzens, E. S. Berry, J. S. Robson, W. W. Talbert, George Marloff, Roy Clayburn, J. K. Mickley, J. L. Loucks, C. D. Baker, W. H. Horsch, H. R. Sheene, S. J. Turreff and S. E. Gillespie. Spaces 67, 68 and 69.

United States Graphite Company, Saginaw, Mich.—Mexican graphite greases and lubricants for railroad purposes. Represented by Walter R. Pflasterer and N. B. McRee. Space 161½.

U. S. Wind Engine & Pump Co., Batavia, Ill.—Wood tanks; steel towers; water columns; outlet valves; float valves; pumps; semaphore switch signals. Represented by L. E. Wolcott, C. E. Ward, J. P. Prindle, T. S. Daniels and G. E. Vermilyer. Spaces 111 and 112.

Universal Asphalt Plank Company, Chicago.—Bridge flooring; industrial flooring; protection to waterproofing; rail filler; highway grade crossings; tight expansion joint. Represented by John T. Joyce, Theo. H. M. Crampton, S. Baldwin, W. R. Meadows and J. E. H. Brown.—Space 184.

Verona Tool Works, Pittsburgh, Pa.—Track tools; rail anchors; rail joint springs. Represented by W. F. Schleiter, B. M. Cheney, H. M. Dommersnoes and J. B. Emerson. Space 41.

Warren Tool and Forge Company, Warren, Ohio.—Tack chisels; spike mauls; sledges; flatters; picks; track tools, levels; **track level.** Represented by Howard Mull, Jos. F. Leonard, J. Arthur Martin, E. L. Ruby and R. E. Bell, Space 30.

Waterbury Battery Company, Waterbury, Conn.—Primary batteries, renewals and parts; **portable lantern operated by telecells.** Represented by M. L. Martus, C. A. Nelson, G. S. Gaunt and B. F. Lollis. Space 39.

Weir, Kilby Corporation, Matthews Engineering Division, Cincinnati, Ohio.—**Engine driven generator set.** Represented by O. DeG. Vanderbilt, Jr., J. K. Lansdowne, C. E. Hogan, H. G. Barclay, H. N. West, M. C. Cosgray and R. L. Nutt, Jr. Space 29.

Western Wheeled Scraper Company, Aurora, Ill.—Air dump cars of both lift door and drop door types. Represented by Jess Mossgrove and J. E. Huber. Space 43.

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.—Portable instruments for signal testing; lightning arresters; cutouts; disconnecting switches; insulators; floodlights, industrial lighting fixtures; samples of concrete poles. Represented by R. H. Kilner, A. L. Schieber, C. F. King, L. A. Spangler, T. W. Merrill, B. R. Hill, J. J. Monroe, C. P. Gordon, H. H. Chapman, G. T. Keech, J. L. Crouse, C. F. Harris, H. E. Kuppinger, H. P. Schrader, R. J. O'Brien, E. W. Beck, P. F. Squier and J. P. Teller. Spaces 21 and 22.

Weston Electrical Instrument Corporation, Newark, N. J.—Ammeters, voltmeters, wattmeters, phase angle meter, ohmmeter, signal railway test set, tube emission tester and other electrical indicating instruments; **Model 480 phase angle meter; Model 523 signal relay set; Model 535 tube emission tester.** Represented by Paul A. Westburg, Alvin Thielke, James F. Inman, Kline Gray, Chas. B. Denton and R. M. Ricks. Space 237.

Wharton, Jr. & Co., Wm., Inc., Easton, Pa.—One-half manganese crossing of Beggs-Sayre design; solid manganese subway switch. Represented by C. M. Griffith, R. C. McCloy, J. R. Smith, C. Shaffner, B. M. Judson and H. F. McDermott. Spaces 52½ and 53.

Wood Conversion Company, Chicago.—Passenger car insulation; refrigerator car insulation; a vibrating device, reproducing to an exaggerated degree the motion of a moving car upon which insulating materials are mounted; **insulating board.** Represented by D. H. Corlette, F. C. Vandervort, Jr., A. H. Purdom, W. A. Wadsworth and C. M. Lee. Space 219.

Woodings Forge & Tool Co., Verona, Pa.—Rail anchors; track tools. Represented by E. Woodings, R. J. McComb, R. T. Woodings and C. L. Woodings. Space 142.

Woolery Machine Company, Minneapolis, Minn.—Five hp. and 7½ hp. engines for section cars; 10 hp. twin cylinder engines with belt and roller chain transmission; 10 hp. heavy duty section car; **two speed transmission; joint oiler; tie scoring machine; power track wrench.** Represented by W. B. Achuff, C. E. Berg, D. F. Coyle, H. A. Rogers, D. A. Woolery, H. E. Woolery and E. M. Flechener. Spaces 231, 232 and 233.

Wyoming Shovel Works, Wyoming, Pa.—Testing machine and block; shovels and scoops. Represented by H. T. Potter, M. S. Hendrickson and E. L. Ruby. Space 101.

Signal Section Registration

THE official registration yesterday of members and guests of the Signal Section, A. R. A., assembled at the Stevens Hotel, aggregated 462 members and 63 guests, or a total of 526. This compares with the first day total registration of 552 last year, 644 in 1927 and 350 in 1926.

Members

A

Acker, C. M., sig. supvr., D. & H., Albany, N. Y.
Ackerman, F. J., sig. engr., K. T., Kansas City, Mo.
Adams, E. L., sales engr., Kerite Insulated Wire & Cable Co., Chicago.
Adkins, A. H., sales engr., Electric Storage Battery Co., Washington, D. C.
Ahrens, C. R., eastern rep., Chicago Railway Signal & Supply Co., New York.
Alexander, A. F., sig. supvr., C. M. & St. P., Minneapolis, Minn.
Alexander, F. W., engr. M. of W., C. P., Winnipeg, Man., Canada.
Allan, T. A., chf. sig. inspr., Can. Nat., Central Region, Toronto, Ont., Can.
Allen, E. A., asst. sig. supvr., N. Y. C., Albany, N. Y.
Allen, P. M., trainmaster, N. Y. C., Jersey Shore, Pa.
Allen, W. P., east. mgr., Union Switch & Signal Co., New York.
Ambach, E. T., asst. sig. engr., B. & O., Cincinnati, O.
Amsden, R. B., asst. engr. sigs., I. C., Chicago.
Anderson, B. T., asst. to vice-pres., Union Switch & Signal Co., Swissvale, Pa.
Anderson, E. T., sig. inspr., I. C., Chicago.
Anderson, E. W., gen. sig. inspr., N. C. & St. L., Nashville, Tenn.
Annear, R. F., sig. supvr., C. R. I. & P., Des Moines, Ia.
Archibald, C. B., salesman, Electric Storage Battery Co., Cincinnati, O.
Ash, P. P., chf. sig. draftsman, L. & N., Louisville, Ky.
Ashley, R. D., supvr. sigs., I. C., Chicago.

Auch, W. F., sig. inspr., C. M. & St. P., Milwaukee, Wis.
Ayers, W. G., supvr. sigs., N. W., Bluefield, W. Va.

B

Bagley, F. H., sig. engr., S. A. L., Savannah, Ga.
Bain, G. F., R. R. sales, Copperweld Steel Co., New York.
Baird, M. A., sig. engr., Erie, New York City.
Baker, R. N., sales rep., The Okonite Co., Chicago.
Balla, J. A., sig. apprentice, Pennsylvania, Pittsburgh, Pa.
Balliet, H. S., spec. engr., N. Y. C., New York.
Bangert, P., office engr., Wabash, Decatur, Ill.
Barron, H., asst. engr., St. L.-S. F., Springfield, Mo.
Baumann, F. J., supvr. tel. & sigs., Pennsylvania, Kane, Pa.
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Becksted, R. I., sig. supvr., C. P., Montreal, Que., Canada.
Beebe, L. A., sig. inspr., D. L. & W., Syracuse, N. Y.
Bell, R. J., sig. draftsman, C. N., Moncton, N. B., Canada.
Bender, F. W., sig. engr., C. N. J., Elizabeth, N. J.
Bentley, R. S., sig. supvr., C. M. St. P. & P., Terre Haute, Ind.
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Bingham, R. C., office engr., I. C., Chicago.
Bishop, C. T., sig. supvr., C. B. & Q., Aurora, Ill.
Bishop, John, sig. form., C. M. St. P. & P., Milwaukee Shops, Wis.
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Black, H. L., supt. sigs., Can. Nat., Central Region, Toronto, Ont., Can.
Blackmore, G. A., vice-pres. & gen. mgr., Union Switch & Signal Co., Swissvale, Pa.
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Booth, W. W., salesman, Crouse-Hinds Co., Chicago.
Borland, W. P., chf., bur. of saf., Interstate Commerce Commission, Washington, D. C.
Bortle, R., asst. engr., N. Y. C., East, Albany, N. Y.
Bousquet, E. N., spec. staff engr., Cleveland Union Terminals, (N. Y. C., West), Cleveland, O.
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Brown, F. C., sig. inspr., I. C., Chicago, Ill.
Brown, L., asst. sig. engr., A. T. & S. F., Topeka, Kans.
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Butridge, J. H., chf. sig. inspr., I. C., Chicago, Ill.

C

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Chamberlain, K., sig. inspr., C. & N. W., Chicago.
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Childs, W. L. chf. sig. maintr., Memphis Union Station Co., Memphis, Tenn.
Christein, Nels, sig. supvr., P. & E., Urbana, Ill.
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Clark, E. H., sig. supvr., A. T. & S. F., Emporia, Kans.
Clark, Leslie, sig. for., C. C. C. & St. L., Terre Haute, Ind.
Claus, W. H., sig. inspr., I. C., Chicago.
Clay, D. M., gen. for. of constr., K. C. T., Kansas City, Mo.
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Comstock, W. A. supvr. sig. constr., D. L. & W., Hoboken, N. J.
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D

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Dryden, W. L., sig. supvr., B. & O., St. George, Staten Island, N. Y.
Dueland, R. C., asst. sig. supvr., C. M. St. P. & P., Webster, S. D.
Duffy, C. M., asst. sig. engr., C. R. I. & P., Des Moines, Ia.
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Dunn, J. H., editor, "Railway Signaling," Chicago.

E

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F

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G

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Garrison, E. T., sig. supvr., C. & O., Clifton Forge, Va.
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Gault, P. M., sig. engr., M. P., St. Louis, Mo.
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Goodwin, C. J., chf. gen. sig. inspr., N. Y. C., East, Albany, N. Y.
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Gregg, W. E., sig. maintr., C. & O., Peru, Ind.
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Griffin, H. W., asst. east. mgr., Union Switch & Signal Co., New York City.
Grundy, C. F., sig. draftsman, K. C. S., Kansas City, Mo.
Guthrie, L. A., act. sig. engr., Can. Nat., Western Region, Winnipeg, Man., Can.

H

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Hanson, E., sig. engr., G. C. & S. F., Galveston, Tex.
Hartvig, C. E., asst. sig. engr., C. R. I. & P., El Reno, Okla.
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Hyatt, T. G., sig. supvr., Wabash, St. Louis, Mo.

I

Inwood, T. G., sig. supvr., N. Y. C., West, Chicago.
Irwin, J. C., val. engr., B. & A., Boston, Mass.

J

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Jerome, J. H., sig. supvr., N. & W., Pulaski, Va.
Jewens, R. H., sig. inspec., Penna., Chicago.
Johnson, H. E., supvr. material and repairs, O. C., Columbus, O.
Johnson, R. K., sig. supvr., C. & O., Peru, Ind.
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Jones, T. A., inspr. sigs., Penna., Philadelphia, Pa.

K

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Kearton, Wilfred, sig. engr., Minn. R. R. & Warehouse Comm., St. Paul, Minn.
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Kidd, A. J., asst. engr., Can. Pac., East, Montreal, Que., Can.
Kilian, H. L., sig. supvr., N. Y. C., West, Toledo, O.
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Kinkaide, H. S., sig. inspr., N. Y. C., Englewood, Ill.
Kinney, F. E., sig. supvr., C. R. I. & P., Cedar Rapids, Ia.
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Kirsch, J. I., supvr. tel. & sigs., Long Island, Jamaica, N. Y.
Knowles, E. F., chf. sig. inspr., N. Y. C., East, Albany, N. Y.
Koch, F. C., asst. to vice-pres., "Railway Signaling," New York City.
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Kunker, J. W., sig. supvr., B. & O., Cincinnati, O.

L

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Laing, T. E., chf. draftsman, A. T. & S. F., Topeka, Kans.
Lambert, P. E., sig. supvr., C. & N. W., Chicago.
Lantz, C. J., supvr. tel. & sigs., Penna., Columbus, O.
Lanier, H., inspr., Wabash, Decatur, Ill.
Leetz, A. F., asst. supvr. tel. & sigs., Penna., Chicago.
Lefold, G. H., sig. inspr., Penna., Chicago.
Leingang, W. C., sales engr., Electric Storage Battery Co., Detroit, Mich.
Leonard, A. J., East. Rep., Handlan-Buck Mfg. Co., New York City.
Lewis, E. H., supvr. sigs., Can. Nat., Central Region, Quebec., Que., Can.
Lewis, H. W., sig. engr., L. V., Bethlehem, Pa.
Linderoth, P. H., material insp., C. M. & St. P., Milwaukee, Wis.
Lomas, H. F., asst. sig. engr., I. C., Chicago.
Lorenzen, H. C., asst. sig. engr., P. M., Detroit, Mich.
Loucks, J. L., sales engr., Union Switch & Signal Co., Chicago.
Loughran, A. J., asst. gen. sales mgr., Thomas A. Edison, Inc., Bloomfield, N. J.
Lucia, H. W., res. mgr., General Railway Signal Co., St. Louis, Mo.
Lummis, J. C., sig. inspr., C. & O., Richmond, Va.
Lundy, B. A., vice-pres., Railroad Accessories Corp., New York City.
Lundy, E. A., pres., E. A. Lundy Co., Pittsburgh, Pa.

M

Mann, B. H., cons. sig. engr., M. P., St. Louis, Mo.
Manuel, W. N., rep., Corning Glass Works, Corning, N. Y.
Marloff, George, asst. west. mgr., Union Switch & Signal Co., Chicago.
Martus, M. L., pres. & gen. mgr., Waterbury Battery Co., Waterbury, Conn.
Mason, R. E., sales dept., International Nickel Co., New York.
Massie, J. F., sig. supvr., L. & N., Knoxville, Tenn.
Mayer, F. G., supvr. tel. & sigs., Penna., Harrisburg, Pa.
McCallum, H. B., sig. supvr., C. R. I. & P., Rock Island, Ill.
McCarthy, D. J., vice-pres. & gen. sales mgr., Chicago Railway Signal & Supply Co., Chicago.
McCaulley, J. E., rep., Union Switch & Signal Co., New York.
McChesney, L. W., vice-pres and gen. mgr., Thomas A. Edison, Inc., Bloomfield, N. J.
McConahay, J. F., sig. supvr., C. M. & St. P., Milwaukee, Wis.

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McCormick, C. B., opr. engr., sig. serv., Electric Storage Battery Co., Chicago.
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McDonald, J. E., sig. supvr., D. W. & P., Can. Nat., Central Region, Virginia, Minn.
McEnery, J. A., sig. supvr., Can. Pac., East, McAdam, N. B., Can.
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McKeen, A. H., system sig. engr., U. P., Omaha, Nebr.
McNeill, E. H., sales engr., The Okonite Co., Chicago.
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Mitchell, F. K., sig. inspr., P. & L. E., Pittsburgh, Pa.
Moak, W. V., sig. supvr., C. C. C. & St. L., Galion, O.
Mock, J. C., sig. engr., M. C., Detroit, Mich.
Molis, B. W., sig. engr., D. & R. G. W., Denver, Colo.
Morgan, H. G., sig. engr., I. C., Chicago.
Morgan, O. J., asst. sig. supvr., D. L. & W., Scranton, Pa.
Morrison, C. H., sig. engr., N. Y. N. H. & H., New Haven, Conn.
Morrison, H. A., sales rep., "Railway Signaling," Chicago.
Morsch, J. F., sig. supvr., Jacksonville Terminal Co., Jacksonville, Fla.
Newman, W. H., sig. supvr., N. Y. C., East Buffalo, N. Y.

N

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Newbegin, P. C., chf. engr., B. & A., Houlton, Me.
Nicholson, F. L., chf. engr., N. & S., Norfolk, Va.
Noble, S. E., asst. sig. engr., C. & N. W., Chicago.
Noell, D. N., sig. supvr., Can. Pac., East, Toronto, Ont., Can.
Norris, C. J., supvr. tel. & sigs., Penna., Akron, O.

O

Oberdick, H. C., sig. foreman, B. & O., Conneaut Lake, Pa.
O'Brien, James, sig. inspr., N. Y. C., Chicago.
Oler, B. F., inspr. sigs., Penna., Philadelphia, Pa.
Olin, B. R., sig. supvr., A. T. & S. F., Marceline, Mo.
O'Meara, T. J., engr., Union Switch & Signal Co., Swissvale, Pa.
O'Neil, C. P., supvr. sigs., T. T., Toledo, O.
Oppelt, J. H., supvr. sigs., N. Y. C. & St. L., Cleveland, O.
Orr, H. H., supt. sigs. & tel., C. & E. I., Danville, Ill.

P

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Parker, J., sig. supvr., N. Y. C., East, Rochester, N. Y.
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Parnell, Loy, sig. supvr., Wabash, Montpelier, O.
Partridge, G. F., supvr. sigs., A. C. L., Petersburg, Va.
Patterson, A. J., sig. supvr., H. V., Columbus, O.
Peabody, J. A., sig. engr., C. & N. W., Chicago.
Pearson, E. N., sig. draftsman, G. T. W., Detroit, Mich.
Persinger, Chas., supvr., sigs., C. & O., Covington, Ky.
Person, G. H., sig. supvr., B. R. & P., Du Bois, Pa.
Peterson, G. A., asst. eng. sig. dept., Wabash, Decatur, Ill.
Pflasterer, G. R., for., sig. shop, N. C. & St. L., Nashville, Tenn.
Pflasterer, H. B., R. R. sales engr., S. F. Bowser & Co., Inc., Chicago.
Pfleging, F. W., sig. engr., U. P., Omaha, Nebr.
Phillips, T. G., sig. supvr., Reading Co., Philadelphia, Pa.
Phillis, G. K., chf. clerk, I. C., Chicago.
Phinney, R. M., comm. eng. dept., General Railway Signal Co., Rochester, N. Y.
Pickett, H. G., gen. sig. inspr., F. E. C., St. Augustine, Fla.
Porter, L. B., asst. sig. engr., C. M. & St. P., Milwaukee, Wis.
Post, H. B., sig. inspr., Penna., Chicago.
Post, W. M., asst. chf. sig. engr., Penna., Philadelphia, Pa.
Price, H. C., gen. sig. inspr., Erie, Youngstown, O.
Pry, E. B., supt. tel. & sigs., Penna., Pittsburgh, Pa.
Punter, W. M., chief sig. engr., Can. Nat., Montreal, Que., Canada.
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Quinlan, J. A., chf. sig. inspr., S. A. L., Savannah, Ga.

R

Raber, S. G., sig. supvr., Erie, Youngstown, O.
Ragland, R. R., sig. supvr., M. P., DeSoto, Mo.
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Rees, M. D., sales engr., National Carbon Co., Chicago.
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Rohan, G. J., sig. supvr., M-K-T., Waco, Tex.
Rooney, M. A., supvr. sigs., C. R. R. of N. J., Phillipsburg, N. J.
Rosenzweig, D. W., sig. supvr., S. P., Lafayette, La.
Ross, Robert, supvr. sigs., P. M., Grand Rapids, Mich.
Routledge, T. E., asst. t. & s. foreman, Penna., Terre Haute, Ind.
Rowe, C. E., sig. supvr., N. Y. C., Chicago.
Rudd, A. H., chf. sig. engr., Penna., Philadelphia, Pa.
Ryan, F. J., supvr. sigs., I. C., Freeport, Ill.
Saunders, J. E., sig. engr., D. L. & W., Hoboken, N. J.
Saunders, W. K., supvr. sigs., R. F. & P., Ashland, Va.

S

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Schindler, G. C., asst. engr., sig. dept., C. & N. W., Chicago.
Schott, A. H., sig. supvr., M. C., Detroit, Mich.
Schroeder, J. M., chf. sig. inspr., N. Y. C. & St. L., Cleveland, O.
Schubert, J. H., sig. engr., N. C. & St. L., Nashville, Tenn.
Schultz, E. E., asst. engr., C. & N. W., Chicago.
Schwendt, B. J., asst. sig. engr., N. Y. C., West, Cleveland, O.
Scott, H. S., gen. for. constr., I. C., Chicago.
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Scott, W. Y., sig. engr., B. & M., Boston, Mass.
Seeburger, F. F., sales engr., Ohio Brass Co., Mansfield, O.
Seifert, G. C., sig. supvr., C. & E. I., Salem, Ill.
Seifert, C. O., sig. supvr., B. & O., Chicago.
Seifert, T. C., asst. sig. engr., C. B. & Q., Chicago.
Seymour, A. W., sig. supvr., N. Y. C., East, North White Plains, N. Y.
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Smith, B. L., sig. engr., C. S. S. & S. B., Michigan City, Ind.
Smith, Charles, sig. inspr., S. L.-S. F., Springfield, Mo.
Smith, E. B., asst. sig. engr., N. Y. C., East, New York City.
Smith, H. E., sig. supvr., G. T. W., Durand, Mich.
Smith, L. W., asst. sig. engr., C. M. & St. P., Seattle, Wash.
Stahl, L. R., asst. sig. engr., L. & N., Louisville, Ky.
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Stansel, W. G., sig. inspr., I. C., Chicago.
Stanton, H. L., engr., tel. & sigs., Penna., Chicago.
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Stecher, C. G., sig. instr., C. & N. W., Oak Park, Ill.
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Stevens, sig. engr., A. T. & S. F., Topeka, Kans.
Stoltz, C. F., sig. engr., C. C. C. & St. L., Cincinnati, O.
Stone, H. V., sig. for., B. & O., Cincinnati, O.
Stone, J. L., supvr. sigs., N. & W., Crewe, Va.
Storms, J. H., asst. sig. supvr., Erie, Jersey City, N. J.

Storms, W. S., asst. sig. engr., Erie, New York City.
Strickland, B. V., chf. sig. inspr., Reading Co., Philadelphia, Pa.
Stuart, F. C., sig. engr., E. J. & E., Joliet, Ill.
Stueber, E. M., sig. supvr., C. B. & Q., Alliance, Neb.
Stueber, L., sig. inspr., C. B. & Q., Chicago.
Sutherland, M., sig., engr., M. C., Brunswick, Me.
Swallow, G., sales engr., Diamond State Fibre Co., Bridgeport, Pa.
Swanson, W. W., sig. inspr., C. B. & Q., Chicago.
Swetland, P. G., sig. supvr., N. Y. C., West, Jersey Shore, Pa.
Swonger, W. A., supvr. tel. & sigs., Penna., Chambersburg, Pa.

T

Talley, W. A., sig. supvr., Southern Pacific Co., Ennis, Tex.
Taylor, C. A., supt. tel. & sigs., C. & O., Richmond, Va.
Taylor, E. S., sig. engr., C. P., East, Montreal, Que., Canada.
Teague, O. R., supt., S. A. L., Charleston, S. C.
Teal, J. E., spec. engr., C. & O., Richmond, Va.
Tegeler, F. A., sig. supvr., C. B. & Q., McCook, Nebr.
Thayer, O. H., sig. supvr., C. C. C. & St. L., Mattoon, Ill.
Thomas, G. K., asst. sig. engr., A. T. & S. F., Topeka, Kans.
Thomas, L., asst. sales mgr., General Railway Signal Co. Rochester, N. Y.
Thompson, H. G., sales mgr., Le Carbone Co., Hoboken, N. J.
Thompson, S. R., sig. supvr., C. & O., Huntington, W. Va.
Thompson, T. P., sig. supvr., L. S. & I., Marquette, Mich.
Thomson, E. K., stkpr., B. & A., Boston, Mass.
Tillett, C. H., sig. engr., Can. Nat., Central Region, Toronto, Ont., Can.
Tomkins, O. S., gen. sig. inspr., C. & N. W., Chicago.
Toft, Guy, supvr. tel. & sigs., Penna., Trenton, N. J.
Trout, G. W., sig. engr. & supt. tel., P. M., Detroit, Mich.
Trout, R. E., gen. sales mgr., Thomas A. Edison, Inc., Bloomfield, N. J.
Turner, F. L., sig. inspr., N. & W., Roanoke, Va.
Turreff, S. J., asst. res. mgr., Union Switch & Signal Co., St. Louis, Mo.
Tyler, R. F., gen. sig. inspr., C. M. St. P. & P., Seattle, Wash.

U

Uhr, I. A., sig. engr., St. L.-S. F., Springfield, Mo.
Underhill, J. D., sales mgr., The Okonite Co., New York.

V

Vandersluis, W. M., elec. engr., I. C., Chicago.
VanWagner, Paul, district mgr., Copperweld Steel Co., New York City.
Vipond, W. S., cable sales mgr., Northern Electric Co., Montreal, Que., Canada.
Vliet, P., gen. for. tel. & sigs., W. & L. E., Brewster, O.

W

Ware, H. C., sales engr., General Railway Signal Co., Chicago.
Warner, E. A., Jr., sales engr., Union Switch & Signal Co., New York City.
Wass, F. E., sig. supvr., G. C. Term., New York.
Weatherbee, W. B., gen. sig. inspr., D. L. & W., Hoboken, N. J.
Weatherby, E. P., sig. engr., T. & P., Dallas, Tex.
Werthmuller, L. S., asst. sig. engr., M. P., St. Louis, Mo.
Westermark, N. J., sig. supvr., C. M. St. P. & P., Spokane, Wash.
Wesson, E. G., asst. sig. engr., C. B. & Q., Lincoln, Nebr.
Wheeler, C. M., sales engr., Union Switch & Signal Co., Swissvale, Pa.
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White, F. J., elec. engr., The Okonite Co., New York City.
Whitney, G. C., chief sig. engr., New York Transit Comm., New York.
Wiegand, F. B., sig. engr., N. Y. C., West, and O. C. Lines, Cleveland, O.
Wight, S. N., comm. engr., General Railway Signal Co., Rochester, N. Y.
Williams, J. F., sig. supvr., C. C. C. & St. L., Springfield, O.
Williamson, A. G., sig. engr., Pittsburgh Train Control Co., Pittsburgh, Pa.
Wills, J. R., sales engr., General Railway Signal Co., Chicago.
Winans, E., sig. engr., A. T. & S. F., Los Angeles, Calif.
Winslow, C. G., asst. elec. engr., M. C., Detroit, Mich.
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Wright, P. V., sig. supvr., G. H. & S. A., San Antonio, Tex.
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Y

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Young, R. C., chf. engr., L. S. & I., Marquette, Mich.

Z

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Zahnen, J. P., sig. supvr., C. R. I. & P., Chicago.

Guests, A. R. A., Signal Section

Barthel, H. R., sales engr., American Steel & Wire Co., Chicago.
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Cleaver, A. W., sig, mtnr., A. T. & S. F., Garnett, Kan.
Constance, Walter, supvr. of reclamation, C. & O., Barboursville, W. Va.
Cripps, G. V., sales engr., Electric Storage Battery Co., Cleveland, Ohio.
Cuthbert, A. D. W., div. engr., C. N., Cochrane, Ont., Can.
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Dodgson, F. L.
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Eksward, F. L.
Fine, C. A., asst. sales mgr., Alemite Mfg. Co., Chicago.
Fink, F. G., General Railway Signal Co., Rochester, N. Y.
Goforth, Oscar, sig. fore., Southern, Oakdale, Tenn.
Goforth, R., sig. fore., A. T. & S. F., Topeka, Kan.
Greene, T. H., div. engr., C. & O., Richmond, Va.
Griffin, James, Rail Joint Co., Chicago.
Griffiths, O. H., asst. engr., I. C., Chicago.
Harrifs, C. L., supt., D. W. & P., Virginia, Minn.
Harvey, asst. engr., Victorian Rys., Australia (General Railway Signal Corp., Rochester, N. Y.).
Keen, C. H., dist. sales mgr., Hubbard & Co., New York.
Kerschner, Edward, mgr., Standard Underground Cable Co., Div. of General Cable Corp., Chicago.
Kimball, E. E., General Electric Co., Schenectady, N. Y.
Miles, R. O., Electric Storage Battery Co., Minneapolis, Minn.
Mills, Day, asst. inspr. trans. (Retired), K. C. S., Texarkana, Texas.
Miller, O. E., cir. engr., C. C. C. & St. L., Cincinnati, Ohio.
MacDonald, F. C., inspr., Interstate Commerce Commission, Washington, D. C.
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McKnight, J. N., sig. supvr., Denver Union Terminal, Denver, Colo.
Lyon, H. D., sig. engr., I. C. C., Washington, D. C.
Naess, R. D., Investment Research Corp., Detroit, Mich.
Nelson, W. D., ser. eng., Le Carbone Co., Chicago.
Nicholson, C. P., asst. engr., N. S., Norfolk, Va.
Patterson, F. M., asso. editor, Railway Age, Chicago.
Pfeifer, H. J., ch. engr., Terminal Railway Assn., St. Louis, Mo.
Potts, C. D., draftsman, N. & W., Roanoke, Va.
Powers, J. T., asst. to V-Chairman, Eastern Group, Presidents' Conference Committee, New York.
Price, E. M., night ch. dispatcher, N. P., Seattle, Wash.

Ragan, J. G., signalman, C. & O., Huntington, W. Va.
Rose, F. E., ch. dispatcher, F. W. & D., Wichita Falls, Texas.
Schieber, A. L., sales dept., Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
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Lollis, R. E., sig. supvr., C. B. & Q., St. Joseph, Mo.
Spicer, Clifford, signalman, C. & O., Gordonsville, Va.
Stolp, E. E., mgr. ry. sales, Jewell Electrical Instrument Co., Chicago.
Titus, B. F., engr. asst., N. Y. C., New York.
Van Vessen, J., sig. fore., Erie, Salamanca, N. Y.
Waggoner, R. M., asst. sales mgr., Hubbard & Co., Pittsburgh, Pa.
Wardwell, F. N., asst. engr., elec. dept., N. Y. C., New York.
Welsh, Wilmer, cir. engr., C. C C. & St. L., Cincinnati, O.
Westbay, J. H., spe. engr., C. C. C. & St. L., Indianapolis, Ind.
Wilson, D. C., asst. to pres., E. A. Lundy Corp., New York.
Zeigler, C. J., ry. sales engr., (S. E. Dist.), Simplex Wire and Cable Co., Jacksonville, Fla.

Signal Personnel Changes During Year

AMONG the important changes in personnel of the Signal Section during the last twelve months are the appointment of two new committee chairmen, A. Vallee, who is directing the work of Committee V—Instructions and W. F. Follett, in charge of the activities of Committee VIII—Alternating Current Automatic Block Signaling. The committees did not lose any members through death and because of this good fortune were able to carry on their work without any interruptions.

A. Vallee, supervisor of signal construction on the Delaware & Hudson, who has been vice-chairman of Committee V—Instructions, was appointed chairman of this committee early last year to succeed J. S. Gensheimer, who had been chairman of this committee since 1925. W. F. Follett, assistant signal engineer of the New York, New Haven & Hartford, who has been vice-chairman of Committee VIII—Alternating Current Automatic Block Signaling, was appointed to the chairmanship upon the resignation of L. F. Vieillard, formerly signal engineer of the Long Island. Mr. Follett has been active also as a member of Committee I—Economics of Railway Signaling.

Two prominent members of the Signal Section were promoted to the position of signal engineer on their respective roads during the year and the responsibilities of a third were extended. Another engineer was placed in a position of greater authority by transfer to a more important post on his railroad. G. S. Pflasterer, formerly signal engineer of the Nashville, Chattanooga & St. Louis, and a member of Committee I—Economics of Railway Signaling, resigned in July, 1928. He has been succeeded as signal engineer of the Nashville, Chattanooga & St. Louis by John H. Schubert, formerly general signal inspector of that road. W. H. Stilwell, who had been acting signal engineer of the Louisville & Nashville, was made signal engineer of the same road in August, 1928. Mr. Stilwell has been a member of Committee V—Instructions for several years.

P. M. Gault, signal engineer of the Missouri Pacific and a member of Committee VI—Designs, and Committee X—Signaling Practice, as well as being vice-chairman-elect of the Signal Section, has been appointed signal engineer also of the International Great Northern and the Gulf Coast Lines, two Texas subsidiaries of the Missouri Pacific System. This additional appointment became effective last July.

J. S. Gensheimer, engineer of telegraph and signals on the Central region of the Pennsylvania, was transferred to the New York electrified zone, last December. Mr. Gensheimer has been very active in Signal Section committee work, having been chairman of Committee V—Instructions for three years and a member for six years. He is also at present a member of Committee III—Editing.

T. C. Seifert, office engineer in the signal department of the Chicago, Burlington & Quincy, was appointed assistant signal engineer of the same road in August, 1928. Mr. Seifert is a member of Committee II—Interlocking.

Year Brings Changes to Members of A. R. E. A.

NUMEROUS changes in the status of the members of the A. R. E. A. have occurred since the convention of a year ago, these changes epitomizing the mutations that life brings with its advance. In the year that has gone by one member was made chairman of the executive committee of one of the largest railway systems of the country, while five other members were advanced to the presidencies of important railways. One member was elected vice-president of the road of which he had been chief engineer, while various other members were promoted to executive positions or to more important posts in the executive or engineering departments, and two members forsook railway careers to enter lines of business for which their railway experience had fitted them. Thirty-four members, one of them a past-president and several other members of long standing and prominence in the association were called by death, four of these having been charter members.

Hale Holden, president of the Chicago, Burlington & Quincy, became chairman of the executive committee of the Southern Pacific System during the last year and at the same time Paul Shoup was made president of the same system, being advanced from the vice-presidency. Another member, F. G. Williamson, vice-president of the Northern Pacific, was elected president of the Burlington to succeed Mr. Holden. E. A. Clift, senior vice-president of the Illinois Central, was elevated to the presidency of the Central of Georgia on March 1, to succeed another member, John J. Pelley, who on the same date became president of the New York, New Haven & Hartford. Fred Lavis, whose experience as a locating and construction engineer extends beyond the borders of North America, was elected president of the International Railways of Central America during the last year. Howard E. Stevens, chief engineer of the Northern Pacific, was advanced to the position of vice-president on August 10, and Earle B. Sloan, under whose charge as chief engineer the difficult mountain work was carried out which closed the final gap in the Southern Pacific of Mexico, was promoted to fiscal representative and president of the local board of directors of that road at Mexico City, D. F.

J. L. Campbell, a past president of the association, who was chief engineer of the El Paso & Southwestern until its acquisition by the Southern Pacific, and after that time assistant to the chief engineer of the Southern Pacific, was appointed chief engineer of the Northwestern Pacific during the last year.

Bernard Blum, formerly engineer maintenance of way of the Northern Pacific lines east of Paradise, Mont., was advanced to the position of chief engineer

of that road, to succeed Mr. Stevens. Guy W. Harris, formerly assistant chief engineer of the Atchison, Topeka & Santa Fe, was made chief engineer of that system to succeed C. F. W. Felt, who died just before the convention in 1928.

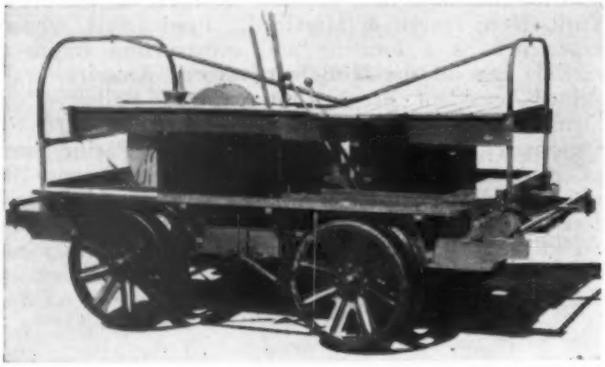
Other members who were advanced to chief engineer of the roads with which they were connected were Robert C. Falconer of the Erie, M. F. Longwill of the Wabash, W. H. Petersen of the Chicago, Rock Island & Pacific, and F. E. Morrow of the Chicago & Western Indiana. J. C. Patterson, formerly superintendent of maintenance of the Erie, was promoted to chief engineer maintenance of way during the year, while in the same period L. J. F. Hughes, special engineer on the Rock Island, was advanced to engineer maintenance of way of that system.

Several members prominent in the activities of the association retired during the last year. Among these was Charles A. Morse, a past president, who was chief engineer of the Rock Island until his retirement on January 1. George M. Davidson, industrial engineer of the Chicago & North Western, and J. George Bloom, engineer maintenance of way of the Rock Island, both of whom have been members for a number of years, also retired on January 1.

Among the members who left railway service to enter other lines of business were H. H. Richardson, formerly engineer of water service of the Missouri Pacific, who is now assistant vice-president of the National Aluminate Corporation, Chicago, and Arthur Harvey, formerly district engineer on the Missouri-Kansas-Texas, who is now connected with the American Hoist & Derrick Company, St. Paul, Minn.

New Fairmont A4 Motor Car Has Two Speeds Both Ways

A MOTOR CAR with two speeds and with a reverse gear that makes these speeds available in either forward or reverse has been placed on the market by the Fairmont Railway Motors, Inc., Fairmont, Minn., for use by bridge and building forces or extra gangs. For ordinary work, with 10 or 12 men and their tools on the car, it can be started in high, while the low gear is provided for starting quickly when hauling heavily loaded trailers. The reverse mechanism is geared direct to the driving or rear axle and



The Fairmont A4 Motor Car Has Two Speeds in Each Direction

is enclosed in an oil-tight, grit-proof aluminum case. The car is thrown into reverse by a gear-shift lever, and an easy push on the belt lever, permitting the car to start backward the moment it comes to a stop. This feature is particularly advantageous when operating the car in large terminal yards.

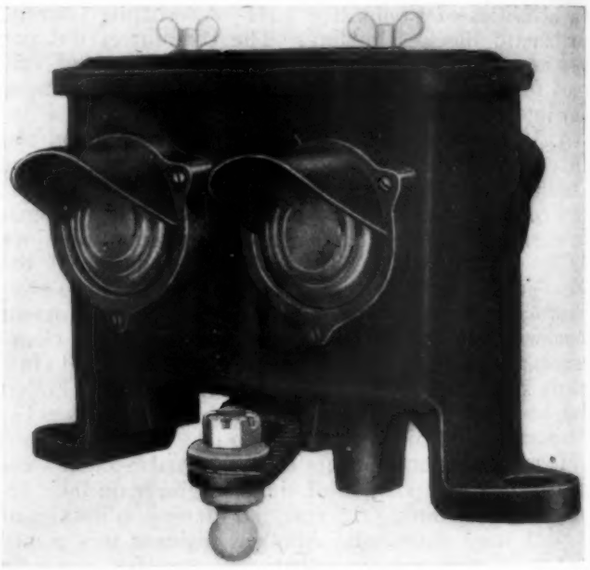
The car is equipped with a Fairmont QB single-cylinder engine developing 11 brake horsepower. Transmission is by means of an endless cord belt which is mounted entirely above the deck, thus keeping it away from the grit and moisture of the roadbed, while its elasticity cushions power impulses and gear shifting.

The car has a steel frame and is designed to offer maximum resistance to stresses between the engine, transmission and axle boxes. The tool trays are large, 79 in. long by 12¼ wide by 8½ deep, with a 9 1-2 in. front guard. The deck extends over the tops of the wheels to serve as foot guards.

The car weighs 1,250 lb. fully equipped, and is easy to take off the track owing to the balancing effect secured by placing the engine above the loose wheel axle, and the employment of high lift pipes and a non-sticking, bronze-bushed loose wheel.

Electric Switch Lamp

A SWITCH SIGNAL with a circuit controller has recently been placed on the market by the Union Switch & Signal Company. This switch signal is designated the style ES32 and is designed to meet varying needs, the circuit controller being operated from the switch points for



Union Style-ES Electric Switch Lamp

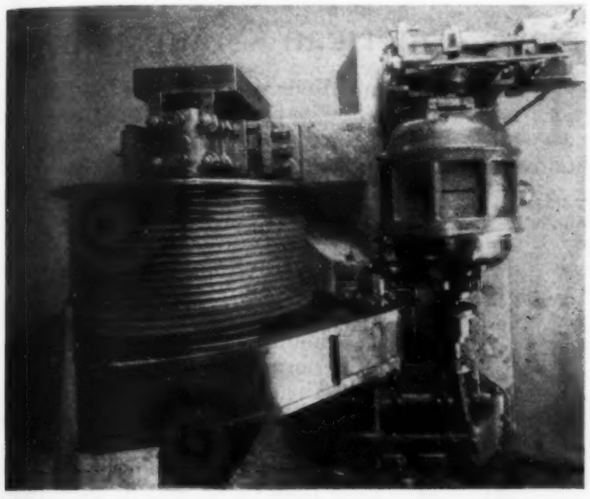
selection between the lamps, thus causing the signal to repeat the position of the switch points. The circuit controller is actuated by a crank attached to the throw rod of the switch, the connection to the switch being made by the standard A. R. A. fitting. A pressure fitting has been provided to permit Alemite lubrication of the vertical bearing supporting the shaft. The contacts are arranged to make only in the full normal or full reverse position. The standard switch rod connection from the circuit controller to the switch may be adjusted for various switch strokes.

The circuit controller may be removed readily as a unit for repair or replacement of parts, and its position at the top of the case just under the cover, facilitates inspection and adjustment of the contacts. The switch signal is illuminated by a single-contact,

bayonet socket, candelabra-based bulb using two bulbs to each unit. The lenses are so placed that the bulb is at the focal point between them. This switch signal may be mounted easily on a pipe-carrier foundation, tie or any flat surface.

Silent Automatic Hoists for Large Coaling Plants

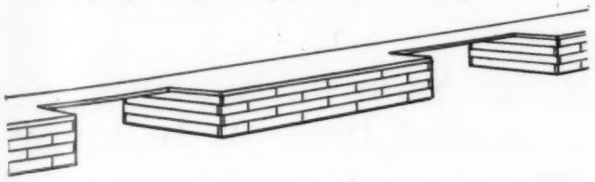
THE Roberts & Schaefer Company, Chicago, has improved the details of its automatic electric-hoist for use in large coaling plant installations by the application of a Falk Telastic gear reduction between the motor and the main countershaft, the reduction operating in an oil bath which not only insures positive lubrication, but silences the operation of the gear, while the case in which the gears are enclosed eliminates the danger of injury to the attendant from the gears. This gear reduction has been adopted by the Roberts & Schaefer Company as its standard for use in coaling plants of large capacity.



Top View of Motor and Hoist with Falk Telastic Gear Reduction

Federal Concrete Cribbing for Platform Construction

A NEW use was recently made of Federal concrete cribbing, manufactured by the Federal Cement Tile Company, Chicago, when it was employed in the construction of a platform for the Western Electric Company at Kearney, N. J. This platform in reality consists of three separate platforms 24 ft. 9 in. long by 9 ft. wide connected by narrow runways, and is used for loading reels of cable.



Loading Platform Built of Federal Concrete Cribbing

In the construction of these platforms, a wall was built on the four sides, using Federal stretchers or face members on the long dimension, with special return members across the ends. The face members were tied together by special header or anchor members extending from one side to the other and connected to both faces. The area thus enclosed was filled with earth and a solid reinforced concrete slab was placed on top to form the surface of the platform. Slots were left in the top members at the ends of adjacent platforms to receive I-beams carrying a concrete slab to serve as a connecting runway.

Federal cribbing, by providing solid faces, retains the filling material and enables it to support a concrete slab properly, which was designed to carry a load of approximately 300 lb. per sq. ft.

Ground Tester Has Three and Four Ranges

AN improved type of megger ground tester has been placed on the market by James G. Biddle, Philadelphia, Pa. The first instruments placed upon the market were available only in two scale ranges, whereas at present the megger ground tester can be obtained either with two scale ranges, three scale ranges, or four scale ranges. The scale values available are as shown below:

TWO-RANGE INSTRUMENTS

0 to 15 and 0 to 150 ohms
0 to 30 and 0 to 300 ohms

THREE-RANGE INSTRUMENTS

0 to 3, 0 to 30 and 0 to 300 ohms
0 to 15, 0 to 150 and 0 to 1,500 ohms
0 to 30, 0 to 300 and 0 to 3,000 ohms

FOUR-RANGE INSTRUMENTS

0 to 3, 0 to 30, 0 to 300 and 0 to 3,000 ohms

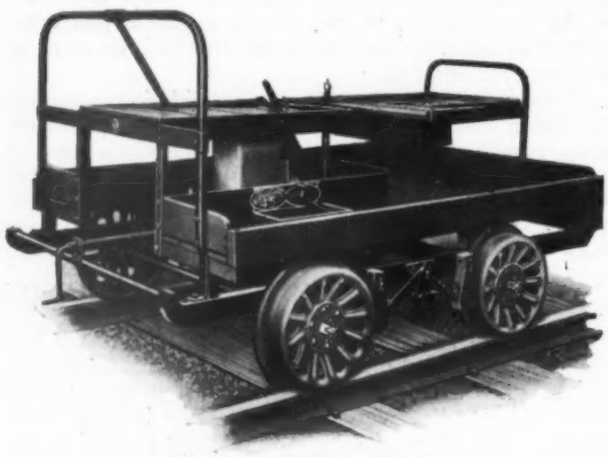
From the above, it will be noted that the instrument is available in ranges from as low as 0 to 3 ohms full scale value, up to 0 to 3,000 ohms full scale. Owing to the fact that the megger ground tester is a direct reading instrument, it is possible for almost anyone to use it and obtain consistent and reliable results. Furthermore, the cost of obtaining ground resistance data is substantially reduced when using the megger tester. In its technical Bulletin 1185, the manufacturer describes the method of testing ground connections with the megger and includes considerable data on various types of ground connections, the electrical characteristics of the earth, and important points as to the location of reference grounds for testing purposes.

New Section Car Has Special Features

A NEW model section motor car has been put on the market by Fairbanks, Morse & Company, Chicago, known as No. 45, which, it is said, embodies all of the refinements of a high grade automobile, and has the additional feature of ease of dismantling and assembly. The new No. 45 has a two-cylinder, four-cycle, air-cooled motor, with patented Ricardo cylinder heads and flywheel magneto ignition. Drive is by friction transmission, with a roller chain from the sprocket on the countershaft to the rear axle, permitting the same speeds in either direction. Timken tapered roller bearings are used throughout on the

crankshaft of the engine and on the axles.

The frame of the car is of the pressed steel automobile type, on which the engine is mounted in three-point suspension and secured by four bolts. This latter feature of the car is of particular importance in making possible the speedy repair of the engine, as the



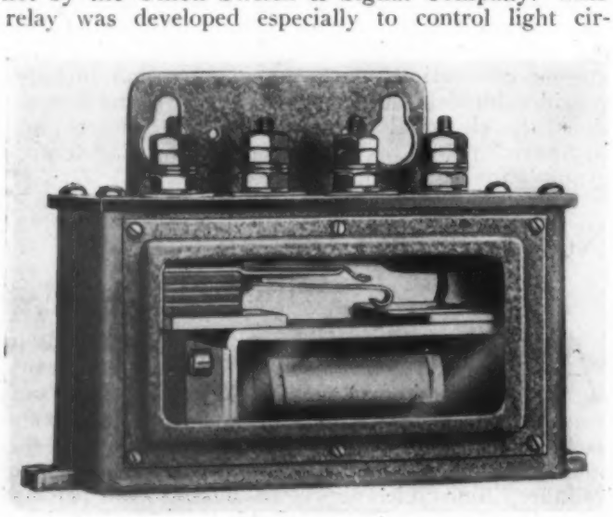
The New Sheffield No. 45

removal of only the four bolts releases the entire power plant, together with all of the control apparatus.

Like other new cars of the company, the new No. 45 has an individual safety seat for the operator, and the unusually large tool space of 22 sq. ft. The entire deck, including the seat top, is held on the car frame by only four bolts, the removal of which allows the entire top to be lifted off, leaving the power plant with all operating mechanisms exposed as on a bench for easy inspection and servicing.

Light-Out and Indicator Relay

A NEW light-out relay which can also be employed as a light indication relay in interlocking service, has been placed on the market by the Union Switch & Signal Company. This relay was developed especially to control light circuits. It is small, compact and dependable and is well calibrated. As a light indication relay it is particularly suitable for use in any circuit where a light indication must be controlled over a long distance. This relay is also designed to control a reserve, or more restrictive, light signal indication in case of a lamp failure.



Style L10 Light-Out Relay

The relay is 6 1/16 in. long, 2⅜ in. wide, and 4¼ in. high. The relay mechanism is enclosed in an aluminum casting and easy inspection of all parts is afforded by a glass window. The casting has been given a black crystalline finish and is fitted with lugs for shelf mounting or, if desired, a bracket for wall mounting. The contacts are silver-to-silver, arranged to be either normally-closed or normally-open. When used as a light-out relay, it may be furnished for use on whatever voltage is required to operate the lamps, and when used as a light-indication relay, it is suitable for use on an 8 to 10-volt circuit.

New "American" Sump Pumps

THE American Well Works, Aurora, Ill., has introduced a new type of centrifugal pump or bilge pump which is electrically-driven by a hollow-shaft motor, thereby permitting the pump shaft to extend upward through the shaft of the motor and to utilize the thrust bearing at the top of the motor for both the pump and the motor, the upper end of the pump shaft being threaded to permit adjustment for the thrust bearing. This arrangement also eliminates the necessity of flexible couplings. The motor is bolted to a cast-iron plate which, in turn, is bolted to the pipe supporting the pump, so that distortion of the pit cover will not affect the alinement of the pump and motor. The pump is controlled automatically by a float which operates a pilot switch, bolted to the pit cover.

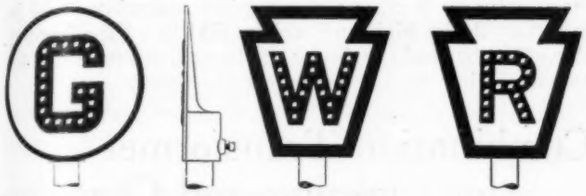
The "American" Sump Pump

These pumps are furnished in complete units, including the motor, switches, float, oiling device and pit cover. If desired, they may be furnished in duplex units, consisting of two single units on the same pit cover, thus permitting both pumps to be operated at the same time to care for any sudden increase of water, or either pump may be operated singly, with the other as a reserve or stand-by unit. The pumps are furnished in sizes ranging from 1½ in. to 5 in., with motors ranging in capacity from 3 to 15 hp.

Reflex Signs for Roadway and Highway Indications

REFLEX SIGNS, which are illuminated at night by the rays from the headlights of approaching locomotives or automobiles, have been developed by the Louisville Frog, Switch & Signal Company, Louisville, Ky., for use either as roadway or highway signs. Reflex signs are made of metal to which the desired letters or other indications are attached these

being made of solid lens-shaped pieces of glass with reflectors which will return the light entering the lens from wide angles, and which, it is said, will reflect the rays to the extent of over 75 per cent of their original



Reflex Roadway Signs

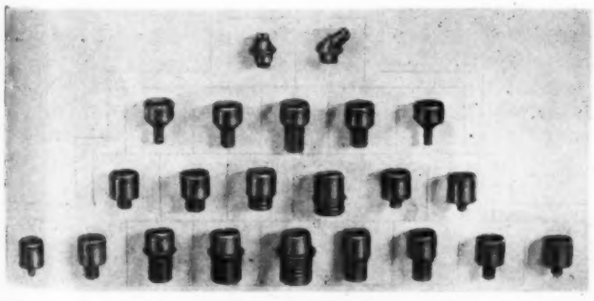
intensity, thus making the sign visible at night long before it could be seen without the illumination.

For roadway purposes, the signs are made of grey iron, the back of the sign being so constructed that it can be mounted on the top of a post made of pipe, to which it is secured by means of a set screw. These signs can be made to conform to the standards desired and the reflector likewise can be furnished in any colors.

The highway signs are made of 16-gage parkerized steel plates with an embossed border and cross $\frac{1}{16}$ in. high, which adds to their strength. The background is painted either white or yellow as desired, and the reflecting lenses may be either red or amber. The letters are six inches high and are made of metal castings. The letters, as well as the embossed parts of the plate, are painted black. It is said that these signs are made visible by automobile headlights at a distance of 2,500 ft. Other Reflex signs made of cast metal may also be furnished for crossing gates, safety islands or other obstructions.

Alemite Develops Improved Drive Fittings and Bushings

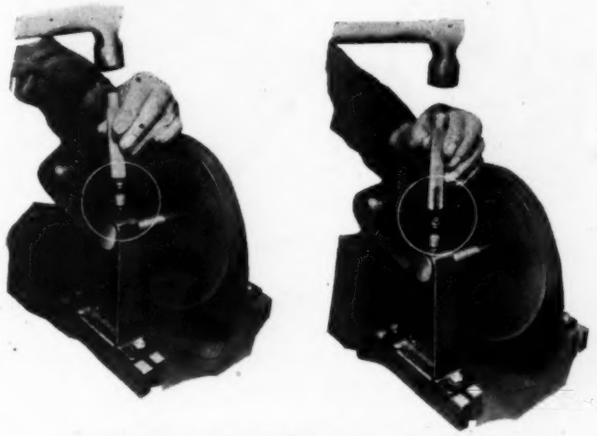
A NEW line of lubrication fittings, which can be driven into existing oil holes on signaling and interlocking equipment, has been developed by the Alemite Manufacturing Corporation, Chicago. The most significant feature of the new fitting is that it is made in two parts, one a brass bushing, which must first be driven into the hole, and the other an



Assortment of Bushings and Two Styles of Nipples for Pressure Lubrication

Alemite straight or angle nipple, which is driven into the brass bushing. The bushings are feather edged so that they become securely swedged in the oil holes in which they are driven. These bushings are manufactured in sizes ranging from ⅛ in. in diameter to ½ in. in diameter in 1/64-in. steps. The proper size of bushing to use is determined by a special ring gage.

The reason that the new fitting is made in two parts is because, in driving the older type fitting into irregularly shaped oil holes, it was found that the ball-check valve assemblies frequently were distorted and rendered ineffective. In the new fitting, the check-valve assembly is completely protected and the man applying the fitting has more latitude when fitting various sizes of oil holes. Three types of bushings are made to cover all service conditions. The standard bushing, as illustrated, is recommended for nearly all oil holes. However, a special bushing is



Left—Driving the Bushing Into An Oil Hole
Right—After Bushing is Driven, the Alemite Nipple is Driven in Place

made for countersunk holes and for holes which are drilled at an angle. The third type of bushing is shorter than the standard and is made for a thin housing to protect against the possibility of the shank of the bushing protruding and striking the bearing shaft. The Alemite push-type compressor is used for lubricating all bearings equipped with the new type of fitting. The compressor is pushed against the fitting.

New Sodium Aluminate Feeder and Chemical Proportioner

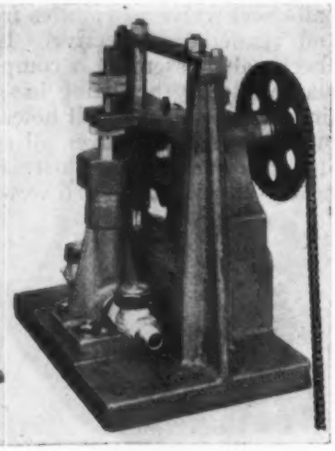
A NEW dry feeder for sodium aluminate, as well as a new line of chemical proportioners, have been developed by the National Aluminate Corporation, Chicago, which embody improvements over its former equipment.

The new dry feeder, which is designated as Type P, provides means for the addition of sodium aluminate separately to the water to be softened. The sodium aluminate is fed through an adjustable opening, which can be regulated for any desired amount, and then passes into a solution hopper, where it is dissolved in water, and thence is pumped to the point of application at the treating plant. The feeder is equipped with a one-horse-power enclosed ball-bearing motor running at 3,600 r.p.m. The feeder is adaptable to any water-softening plant and does not need the additional headroom that was necessary with the Type F dry feeder.

The Nalco chemical proportioners provide an automatic proportioning of the solution to the water,

and are of heavier construction than the former proportioners, while improvements have been made in the packing glands and in the means for lubrication. The pumps are also more readily adjustable for any

The Dry Feeder



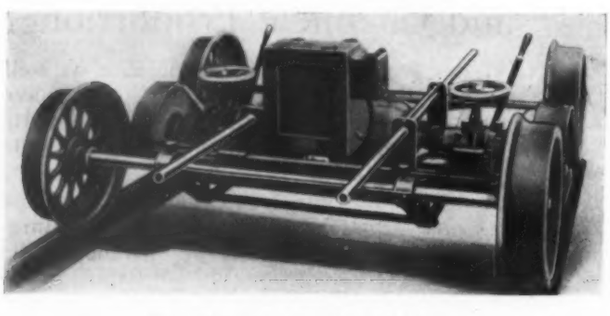
The Nalco Proportioner

desired feed, and may be driven directly from pumps or engines or by means of a chain drive. Where city water is available, they may also be driven satisfactorily by a Nalco water motor.

The Ryerson Track Grinder

THE extensive use of the welding process for the building up of rail joints under traffic has demonstrated the need of a rail grinder which will operate rapidly and efficiently in smoothing up the surface of the welds and which can be removed from the track easily to clear trains. To supply such a machine for general use on the railways, Joseph T. Ryerson & Son, Inc., Chicago, has developed the Ryerson track grinder, which is said to save almost two-thirds of the time usually required for this kind of work.

In this machine, which is mounted on a steel-frame car, the grinding wheels, 12 in. in diameter with a 1½-



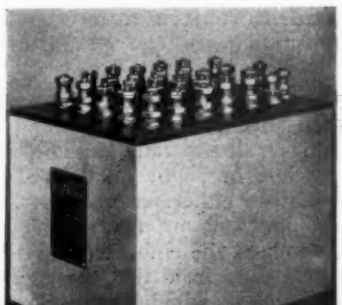
The Ryerson Track Grinder

in. face, operate independently at high speed on separate heads located between the wheels of the car, being driven by a three horsepower motor through flexible couplings and helical gears. The motor is controlled by an automatic starter, and a push-button control for each grinding head is located within convenient reach of the operator. The motor and gears are completely housed, while metal safety guards are provided over the grinding wheels.

The steel frame of the car is mounted on axles running in ball bearings to permit easy movement back and forth when grinding or when the car is being moved from joint to joint. The complete assembly is 64 in. long and 22 in. high and weighs 800 lb. Pipe handles, extending beyond the frame of the car, are provided for use in setting the car on or off the track.

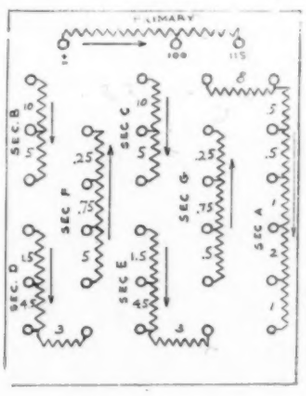
Combination Transformer for Lighting and Charging

THE Fansteel Products Co., Inc., North Chicago, Ill., has brought out a new line of transformers known as its Type-RU. This transformer is of 500-va. capacity and is provided with a primary wound for 110 or 550 volt circuits of frequencies ranging



Fansteel Type-RU 1 Transformer

from 25 cycles to 100 cycles per sec. Almost any desired combination of lighting and charging secondaries can be furnished. For example, the Type-RU1 transformer is supplied with one lighting and two charging secondaries. Taps are provided to permit regulation



Wiring Diagram

of the output. Each charging secondary will deliver 4 amp. at 25.5 volts. This charging current, however, is adjustable in steps of ¼ amp., without the aid of an external resistance. Each transformer is tested at 10,000 volts for insulation strength and conforms in all respects with the requirements of the A. R. A. specifications covering transformers of this type.